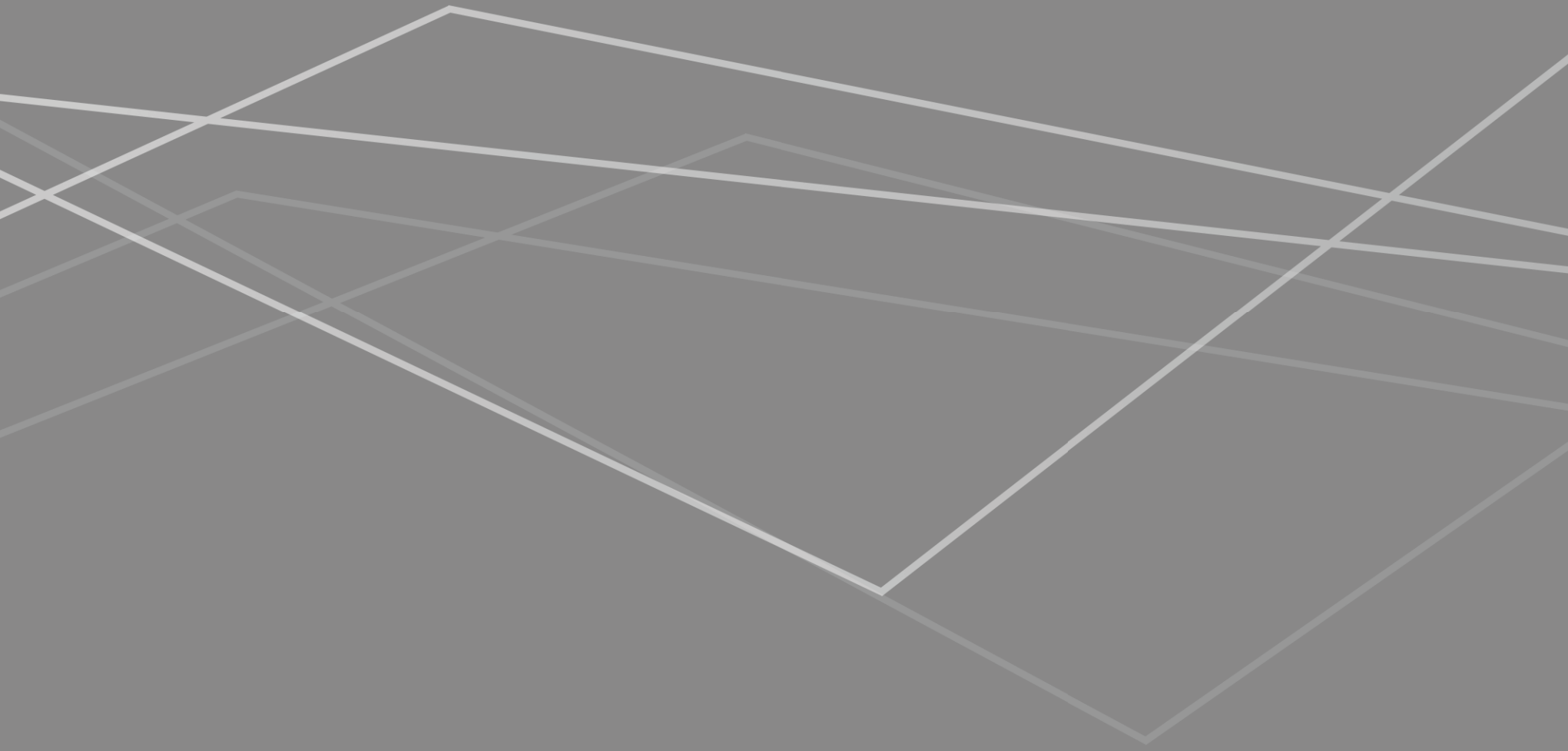
LIBRARY IN BETWEEN

architecture as process

ESA HOTANEN
Tampere University of Technology
Master's Thesis, 2013



ABSTRACT

TAMPERE UNIVERSITY OF TECHNOLOGY
Master's Degree Programme in Architecture
HOTANEN, ESA: LIBRARY IN-BETWEEN, architecture as process
Master of Science Thesis, 106 pages (inc. attachments)
August 2013
Major: Architecture
Examiner: Professor, Ilmari Lahdelma

This master's thesis in the field of architecture deals with architectural processes mainly as a part of creative process rather than building practice of architecture. Architecture has been seen here as close to art-like discipline that expands the traditional modern way of seeing architecture as rather independent process. This thesis promotes design methodologies that are more connected to its surrounding conditions, not only site, but also people, surrounding functions and flows in space.

The main subject of the thesis is The Helsinki Central Library Open International Architectural Competition. The competition has been used as practical framework of the thesis providing program and site for inspection. However, this thesis does not provide a competition entry, but rather shifts the focus on the creative process of architectural work.

The creative process is conceived here as a way of multidisciplinary attitude towards the practice. The project introduces a new positivist and research based approach to architecture that is based on documentation of project data. As a part of this data accumulation thesis introduces graphic way of dealing with information with diagrams and other drawings.

TIIVISTELMÄ

TAMPEREEN TEKNILLINEN YLIOPISTO
Arkkitehtuurin koulutusohjelma
HOTANEN, ESA: LIBRARY IN-BETWEEN, architecture as process
Diplomityö, 106 sivua (sis. liitteet)
Elokuu 2013
Pääaine: Arkkitehtuuri
Tarkastaja: Professori, Ilmari Lahdelma

Tämä Diplomityö käsittelee ensisijaisesti arkkitehtuurin luovaa suunnitteluprosessia, jossa korostuu suunnittelun taiteellinen ja tieteellinen puoli enemmän kuin pragmaattinen projektityö. Tässä työssä arkkitehtuuri nähdään taiteen-kaltaisena prosessina, jonka avulla on mahdollista laajentaa perinteistä modernistista arkkitehtuurikäsitystä. Työssä käytetään uusia suunnittelumenetelmiä, joiden tarkoitus on yhdistää suunnitelma projektin ympäristössä vallitseviin olosuhteisiin, kuten ihmisten käyttäytymiseen, ympäröiviin toimintoihin ja asioiden virtoihin tilassa.

Diplomityön pääaiheena on Kansainvälinen Helsingin keskustakirjaston arkkitehtuurikilpailu. Kilpailu luo DI-työlle viitekehyksen niin suunnitteluosuutta kuin teoreettista tarkasteluakin varten. Kuitenkaan, tässä DI-työssä esitetty suunnitelma ei ole varsinainen kilpailuehdoitus vaan suunnitelmaa on käytetty osana suunnitteluprosessin kuvausta ja tarkastelua.

Luovaa suunnitteluprosessia on työssä käsitelty poikkitieteellisenä suhtautumisena arkkitehtuuriin. Projektissa esitellään tutkimukseen perustuva lähestymistapaa arkkitehtuuriin, joka perustuu suunnitteluprosessin ohessa tuotettavan informaation dokumentoiniin ja järjestämiseen. Osana tätä prosessia käytetään graafista metodia, jossa hyödynnetään paljon diagrammeja ja muita piirustuksia.

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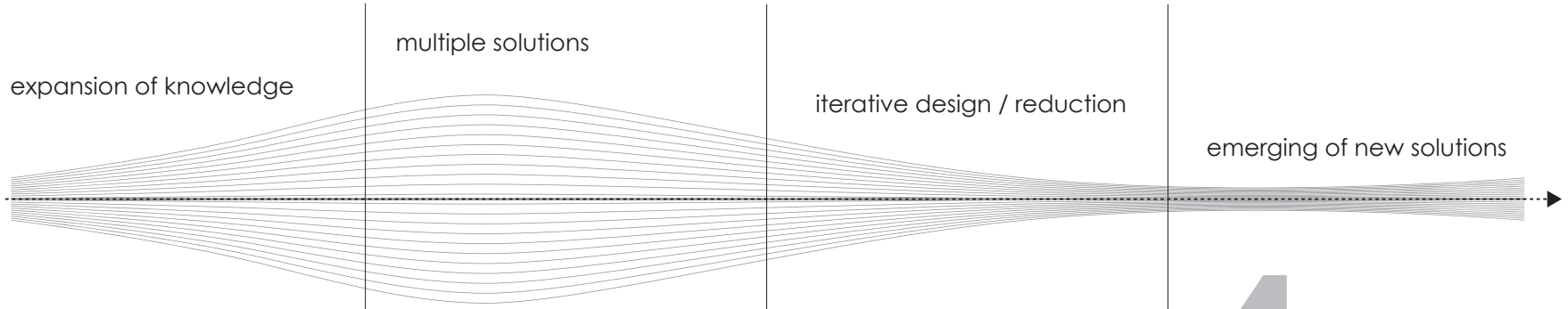
0

INTRODUCTION



1

ANALYSIS OF PROBLEM/TASK
background and relations in project

2

DEVELOPMENT OF SOLUTIONS
by existing design methods, theories and technological innovations

3

ITERATIVE DESIGN PROCESS
testing and refinement of solutions

4

REFLECTION (final design)
to produce design principles and enhance solution implementation

In the recent years there has been a frequent discussion about the future of architecture. There has been obvious shift in the role of an architect. The change is mainly due to changes in the practice. There is constant push for more efficiency in terms of time. At the same time the field is expanded by demand for increasingly more skillsets, such as software usage, marketing and social sciences. This marks a way to more multidisciplinary attitude of the practice. Under the circumstances the traditional modernist way of seeing architecture as combination of site properties and building program, is not sufficient.

Architecture cannot be seen as superior paradigm that can form self-sustained entity - and rejecting the events surrounding it. There needs to be interaction that can take the form of information, energy, or material transfers into or out of the system boundary, depending on the discipline which defines the concept. There is a need for grasping this newly emerged super-complexity.

This project introduces a new positivist and research based approach to architecture. The goal of the project is to use Helsinki Central Library Competition as a design assignment and demonstrate presented design method to building design. The design method is based on the use of mapping relations in design task. This approach is founded on the use of free associations of data and design parameters. It promotes non-linear design process that can produce multiple solutions instead of one.

The diagram on the adjacent page presents an iterative design process of an architectural project, which includes four phases: 1. ANALYSIS OF PROBLEM/TASK, 2. DEVELOMPENT OF SOLUTIONS, 3. ITERATIVE DESIGN PROCESS, 4. REFLECTION (Final Design). These four parts of design process are presented in analogue with the structure of Chapters in this Thesis. In the Chapter One the background for the project is introduced including site and building type (i.e. library) analysis. Chapter Two focuses on the theoretical background of the project. This part of the document forms 'the composition' for the rest of the project continued by extensive walk-through of the project in Chapter Three, and finally Chapter Four consists of conclusions and further questions. The final project images of library design are presented in the Attachments.


diagram/image

DEFINITION OF DOCUMENT STRUCTURE (HEAD TITLE)

In this page, the structure of the document is introduced. The whole thesis work uses the same structure and layout presented here.

DEFINITION OF KEY-CONCEPTS (SUBTITLE)

The main text, which is defining theoretical background of relevant are written in equivalent paragraphs. As a subtitles the key concepts are presented, which allows easy way of flicking trough the document.

The text written in italic is explaining the diagrams or pictures that appear on the left page of each spread. In the practice this text is defining the practical part of The Thesis work.

The background of the project is formed by three main elements: design task (Helsinki Central Library Competition), the site (Töölönlahti), and design method. In this Chapter 1, the background of library design and the site of Töölönlahti are studied.

The design method is presented in the following Chapter 2. By combining the information related to three main elements of project background, the actual design process is formed.

1

BACKGROUND ANALYSIS

ANALYSIS OF PROBLEM/TASK

DESIGN TASK / PROGRAM

TIMELINE (of public library design)

CENTRAL LIBRARY OF HELSINKI

(DESIGN PROCESS)

SITE / TÖÖLÖNLAHTI

TIMELINE (of Töölönlahti history)

HELSINKI CENTRAL LIBRARY COMPETITION

The City of Helsinki arranged an open international architectural competition for the design of a Central Library. The competition was arranged as an open two-phase international architectural competition between 5.1.2012 –20.2.2013. For this Thesis, the competition provides the design task, however the design presented in this Thesis is not a competition proposal. The main elements of library design are depicted in the adjacent page.

In terms of both the cityscape and its symbolic significance, the Central Library will be located in the very centre of Helsinki, the Töölönlahti ('Töölö Bay') area. The new building will form a cohesive totality with the Finnish Parliament building, Helsinki Music Centre, Finlandia Hall, Kiasma Museum of Contemporary Art and other major buildings located in Töölönlahti area.

As stated in the Competition Program, the new Helsinki Central Library will be a combination of personal cultivation, culture and entertainment. It will be a vibrant and functionally versatile meeting place, a house of literature in which the users are the focus. The library will be at the forefront of the renewal of the city's library services and the "*Heart of the Metropolis: the Heart of Helsinki*" (*Competition program*,10).

The competition looks for a design solution for the central library building that (*Competition program*, 10):

- responds to the challenges set by the cityscapewise unique location, and adjusts to the urban fabric and blocks of Töölönlahti

- is high quality and timeless architecture.

- forms a symbolic and significant building that resonates with society as a whole and expresses the operational concepts of the building in an intriguing way

- offers a functionally high-quality and technically and spatially flexible framework for cutting-edge and adaptable library operations.

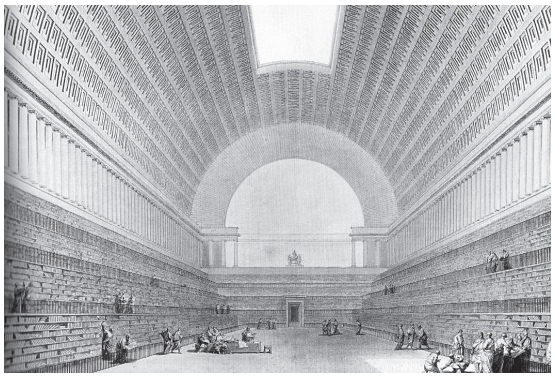
- is eco-efficient

- is technically and economically feasible

1 PUBLIC LIBRARY
'book storage'

2 MEDIATHEQUE
' mediaspace'

3 FUTURE LIBRARY
'weak signals of the future'



Étienne-Louis Boullée 1785,
vision of french National Library

Toyo Ito 2001,
Sendai Mediatheque

UNStudio 2010,
Urban Library of the Future and Centre for New Media plan, Gent, Belgium

1990

2010

HISTORY AND FUTURE OF PUBLIC LIBRARY

The history of public library design is rooted in the era of Victorian philanthropists, who strove to maintain collective order while facilitating individual exploration. But today's advances in technology and civil unrest have put this dual requirement to the test (*Prizeman,* 2011: 56). The building type of public library is one of the last moral universes that are serving public good.

The history of public library design is entirely related to this challenging dual requirement: to maintain collective order while ostensibly encouraging to individual exploration. The Victorian roots of the public library movement devised various means by which access to books might be safely shared among an increasingly large and diverse group of people.

With few exceptions, the history of the public library is relatively short − 160 years or so − and is closely related to the progress of political enfranchisement (*Prizeman,* 2011: 56). While all buildings designed to contain books are potentially engaging, it is those which negotiate the direct interface between a body of knowledge and an open urban realm that face the most complex challenges. Libraries of today are tackling the challenge as they attempt to bridge the past and the present.

In the chart presented three phases of public library development are introduced with examples.

The first phase of public library is based use of metaphor of library as 'book storage' that targets to see library as in its traditional function, the exploration space for books. The second major phase emerged in the mid-nineties was called as 'mediatheque' (i.e. mediaspace). The change was first and foremost powered by emergence of digital media and changes in the role of public library. The third phase or rather projection of emerging signals is consisting of new perspectives and expectations of the future library.

Stockholm Main Library (1927, Gunnar Asplund)

1ST PHASE: PUBLIC LIBRARY

The history of public library design is entirely related to this challenging dual requirement: to maintain collective order while ostensibly encouraging to individual exploration. The requirement to enable visual surveillance of such spaces in the past was the driving force behind their physical and spatial arrangement.

Thousands of libraries, from Robert Smirke's 1857 British Library to Alvar Aalto's 1965 Seinäjoki Library, had *a radial plan* enabling librarians to monitor readers with optimum efficiency (*Prizeman,* 2011: 57). The French botanist and conchologist Jules Paul Benjamin Delessert had first proposed the application of Jeremy Bentham's Panopticon prison design for libraries in 1835: "*We can not doubt the immense advantage for surveillance, to be placed in the centre of the building*".

The Panopticon is the concept to allow a watchman to observe (-opticon) all (pan-) inmates of an institution without them being able to tell whether or not they are being watched. Physically panopticon was adapted by round shape, in which the watchtower was located in the middle of the plan that allowed view to all directions. Panopticon state organization is also known as '*all seeing eye*' (*Foucault,* 1975: 275). The typical utilization of panopticon principle in public library is in adaptation of *rotunda*, which is a circular ground plan, often covered by a dome. Typical rotunda can been seen in the picture of The Stockholm Main Library by Gunnar Asplund (1927).

The history of public library is still present in today's applications. For example, in the competition program of Helsinki Central Library architectural competition includes the following guidance: "*There is a good view towards the main entrance from the reception and information point. There is a separate lockable control room in connection with the information point* (*Competition program*, 54)."

Sendai Mediatheque (1995, Toyo Ito)

2ND PHASE: MEDIATHEQUE

Technical development of digital technologies has facilitated the biggest change in the history of public library. The traditional physical media, such as books, magazines and audio-visual media, has come become less dependent on the surroundings. Information can be accessed anywhere, it is the simultaneity of all media and curatorship of their contents that is making library vital. The shift in forms of media consumption, the role of library as social space and increasing commercialism has created new kind of requirements for the public library. The change is mainly visible in 'mediatheque', by increased spatial flexibility and shift in function as social space.

FLEXIBILITY

The key change of Mediatheque when compared to the traditional library is a state of flexibility and adaptability. Flexibility in contemporary libraries is conceived as creation of generic floors on which almost any activity can happen (*Cortes,* 2007: 105). Programs are not separated, rooms or individual spaces not given unique characters. It is a space where activities are not separated from one another with not more than book shelves or other furniture. This principle of generic space is well visible in the image Sendai Mediatheque by Toyo Ito (adjacent page).

SOCIAL SPACE

The library's role in society has been in transition, the focus of library has changed to more of a social center. It emphasizes the role of the library as an open for meeting, working and place for different interests. Thus there is need for a library as physically existing space and it has a special role in current city planning as a non-commercial space with equality.

ICA Boston Mediatheque
(2002, Diller & Scofidio + Renfro)

3RD PHASE: FUTURE LIBRARY

As for the 3rd phase of the future library, there is no evident shift as with mediatheque, however there are some weak signals of the future of the public library. Some of the new perspectives and expectations of the future library are presented in the following (*Central library review report*, 2007:32):

MEDIA AND TECHNOLOGY
The future library is a multimedia hub for cultural encounters on a human scale, with an ideal blend of knowledge, skills and stories. It is place for a quick dip or total immersion, quiet reflection or spirited brainstorming.

INCREASED COMMERCIALISM
Feature for a new kind of library is the change of existing substantial commercialism. Current libraries contain more commercial services, such as bookstores, restaurants, etc. The spatial features of the future library are resembles more commercial centers with multistory open spaces.

SOCIAL HUB
The library of the future is a social hub. The collection is constantly evolving. An event marks a change. It can be a big or small occasion that generates action and inspires people to visit the library. Events are an excellent opportunity for cooperation and variety of accasions to take place.

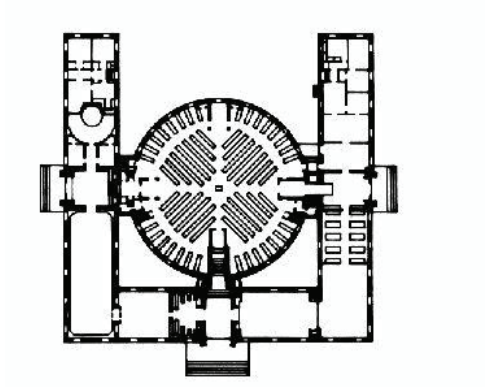
SOCIAL SIGNIFICANCE INCREASES
Library as an institution holds task social equality and acceptance. Library should be open for all citizens and also visitors.

SUSTAINABILITY AND HEALTH
Today's ethical panacea of sustainability is readily married with such positive and extrovert programs. While often led by target-driven mechanisms, it is to be hoped that buildings with such lofty moral status may start to deliver enviable environmental innovation.

1st phase

STOCKHOLM MAIN LIBRARY

Gunnar Asplund 1918-1927

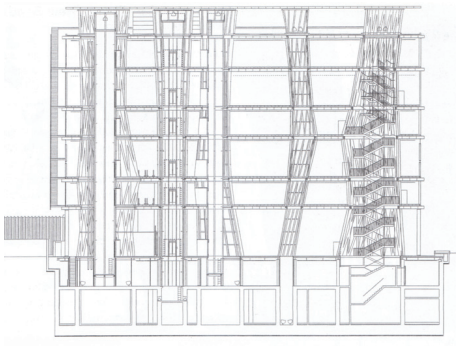


Stockholm's main library by Gunnar Asplund presents typical early1900's public library with *rotunda* plan. It represents early functionalism of Sweden.

2nd phase

SENDAI MEDIATHEQUE

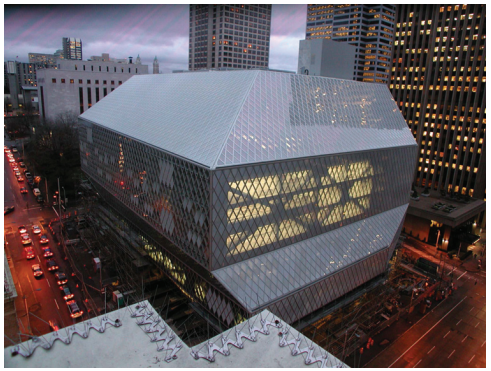
Toyo Ito 1995-2001, (21000m^2)

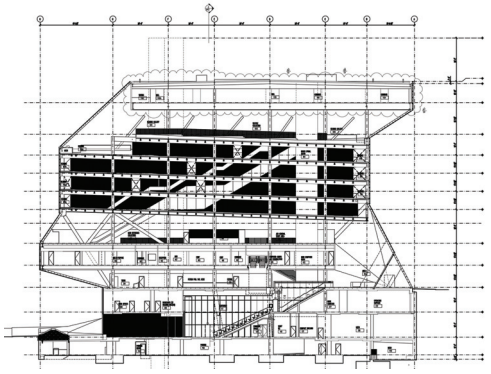


Sendai mediatheque is one of the most remarkable buildings defining the media-theque. Building is based on open plan floors with loadbearing shaft structures penetrating slab-structures.

SEATTLE CENTRAL LIBRARY

OMA 1999-2004, (38000m^2)



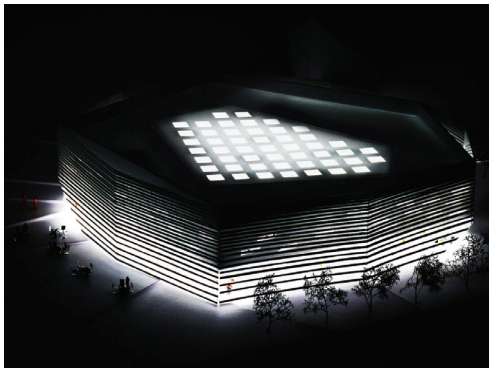


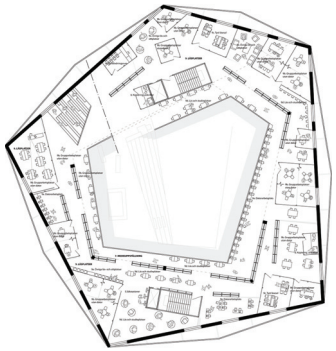
The spatiality of Seattle library is based on staking blocks with different programs and open spaces are formed in the between. It also introduces '*bookspiral*' concept to public library (gently sloping ramp with bookshelves).

3rd phase

DALARNA UNIVERSITY LIBRARY

Adept architects + Sou Fujimoto 2009-2017

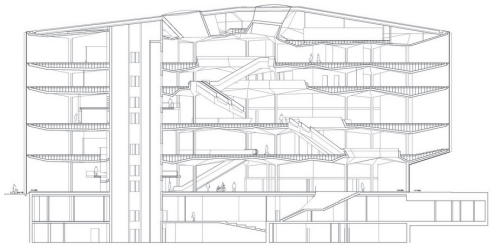




Dalarna University library is a recent competition winner by Adept architects + Sou Fujimoto. The library arrangement is based on spiral plan with resemblance to rotunda plans.

DEICHMAN LIBRARY, OSLO

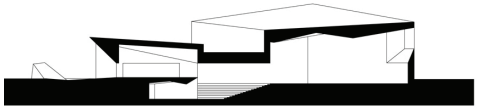
Lund Hagem Arkitekter 2009-2017, (18 000m^2)



The new plan for Oslo main library utilizes nano-technologies in the facade. The spatial organization is based on the four tilted openings that are combined in the middle of building.

SEINÄJOKI LIBRARY, SEINÄJOKI

JKMM 2009-2012, (4400m^2)



The new Seinäjoki library by JKMM architects is build around triagular shape open space in the middle of building. There is also distant recemblance to rotunda plan.

THE SITE OF TÖÖLÖNLAHTI

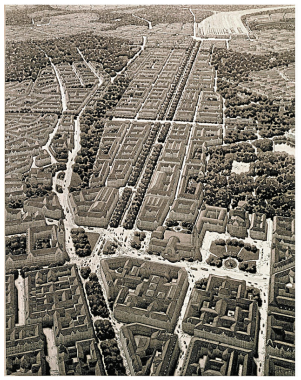
The site of the competition, Töölönlahti ('Töölö bay') is area located in the middle of southern Helsinki that is formed by the actual bay and park surrounding it. The Töölönlahti area is among the most prestige areas in the Helsinki city center that is surrounded by several important public buildings, such as: The Finnish Parliament building, Finlandia Hall, Kiasma Museum of Contemporary Art, Helsinki Music Centre and the Helsinki central railway station (see the adjacent picture).

Over the past decades, plans and competitions for the area have been devised by Eliel Saarinen, P.E. Blomstedt, Alvar Aalto and many others. Some of the most remarkable of them have been studied in the following study (pages 28-29). Töölönlahti area which was to become Helsinki's new centre and the symbolic center point of the nation.

In 2006 the Mayor of Helsinki set up a '*Central Library working group*' to investigate the feasibility of a cultural centre that would be structured around a library with the latest IT and media services. The Töölönlahti city block number 2014 was eventually chosen as the location for the new library (*Competition program*, 35).

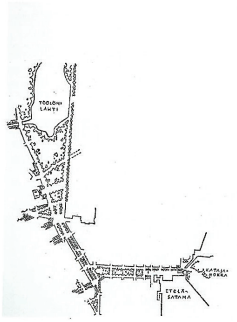
The plans for Finlandia Park were approved on 18.3.2009. The target is to turn the area into a meeting point of Helsinki people and a lively, versatile and functional environment (Finlandia Park, www-page). The southern part of Töölö bay is a classy part of the developing and compact inner city. The parks, streets and squares in the area form a uniform and functional cityscape whole. The central library will be the final part of major buildings in the site according to current plans.

TÖÖLÖNLAHTI: Architectural proposals 1918-2011
(Murole, 2012)



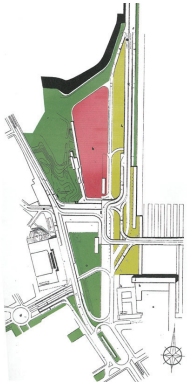
Plan by Eliel Saarinen and Julius Tallberg 1918, was held as starting point of modernist planning in Töölönlahti. In this plan, water areas of Töölönlahti were filled and boulevard streets to Pasila were added. This was one of the most controversial plans, and any parts of the plan were not realized.

1918



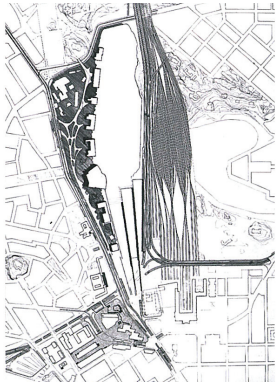
Later in the 1931, P.E. Blomstedt, made plan that criticized the landfill of Töölönlahti. P.E. Blomstedt demanded more preserving approach to design, which later came as unwritten guideline of Töölönlahti Design.

1931



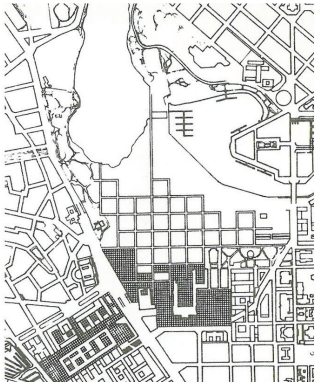
In 1954 plan Lindegren-Kråkström, placed the interchange in front of the Parliament House. The future Finlandia Hall was pointed by a pavilion. Otherwise the area was occupied by lawns and parking. The plan by L-K has been the stand point for the 1959 Master Plan.

1954



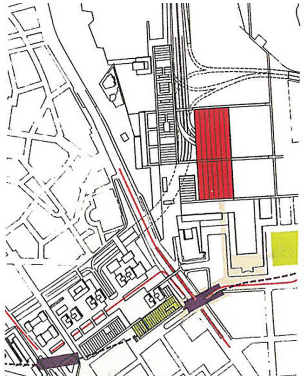
In 1959 plan Alvar Aalto, was inspired by Piazza San Marco in Venice. The plan included terraced square in Töölönlahti. The only part that was finally build from 1959 plan was the Finlandia Hall that was finished in 1971.

1959



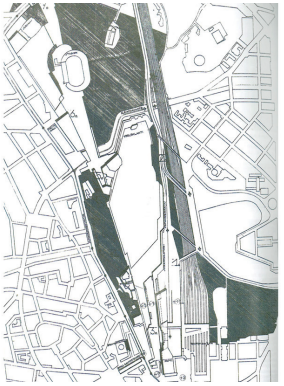
H10 Helsinki Study was conducted by group of young architects from Department of Architecture in Helsinki University of Technology. The group presented mechanistic plan to solve the future of Helsinki. This plan has also been discussed its' influence to the 1969 traffic plan by Smith and Polvinen.

1967



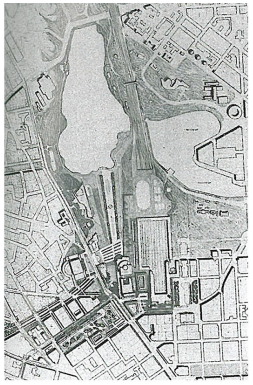
1960's idealistic plans continued, when H67-group designed the "mastodon" to Töölönlahti. Team H 67, was founded by City Planning Department of Helsinki. In the plan, massive traffic terminal was placed at 'Terassitori'. Alvar Aalto later called this building as: "the mastodon, which destroys the heart of Helsinki".

1969



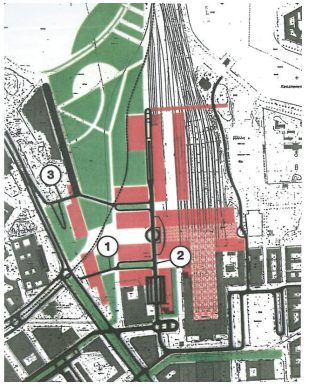
Alvar Aalto's second opportunity to supervise the mayor's committee in 1971 was resulted to the plan that was dominated by a long 'traffic square' as termination of the main arterial from the north. The proposal was dominated by idealistic plan of Töölönlahti area use.

1971



Kamppi-Töölönlahti ideas competition in 1986 was the last extensive attempt to solve Töölönlahti area as a whole. The result of the competition was that the first place was divided between three proposals. These proposals were held idealistic, but the influence to the future plans is obvious. The water extension of Töölönlahti was for first time proposed here.

1986



The debate of the future of Töölönlahti continued in 1991, as most of the proposals by 1986 competition were held as inadequate. During the preparation of The Töölönlahti Master Plan 1991 covering railway was considired as proposed by some of the competition proposals in 1986.

1991

The current plan of Töölönlahti and Finlandia Park in 2011 is composed by town planning authorities of Helsinki. The plan is combination of 1991 master plan and landscape architecture competition held in 1997. The debate of the future of Töölönlahti is still continuing.

2011

The design method forms the standpoint for the project. In this project, it is as relevant part, or even more so, than the design outcome of the project itself. The design method is based on the current theories of architectural design and other fields of design. The presented theory of Relational Design forms a complete new kind of insight into architecture, by expanding the scope of examination, to embody the events taking place around the architecture rather than seeing architecture as autonomous discipline.

DESIGN METHOD

DEVELOPMENT OF SOLUTIONS

2

CRITICAL ARCHITECTURE	/	**PROJECTIVE ARCHITECTURE**
CRITICISM		POSITIVISM
FORM		CONTEXT
LINEAR DESIGN		**RELATIONAL DESIGN**
REPRESENTATION		RESEARCH BASED
(SINGLE) PROGRAM		MULTIPLE ENGAGEMENTS
‘AUTONOMOUS’		INTERDICIPLINARY

Taking place in the past decade in academic architecture discursions, the projective architecture was an attempt to conceptualize a kind of positivist and research-based mode of architecture. One of the most important concerns of the projective architecture was a shift away from the critical architecture of the 1970s and 1980s, by which meant architecture based on negation and demonstrative opposition. The claim was that critical architecture, instead of opening up constructive new possibilities, rather focused on static representation, that is, a mere formal depiction of opposition (*Rendell*, 2007: 34).

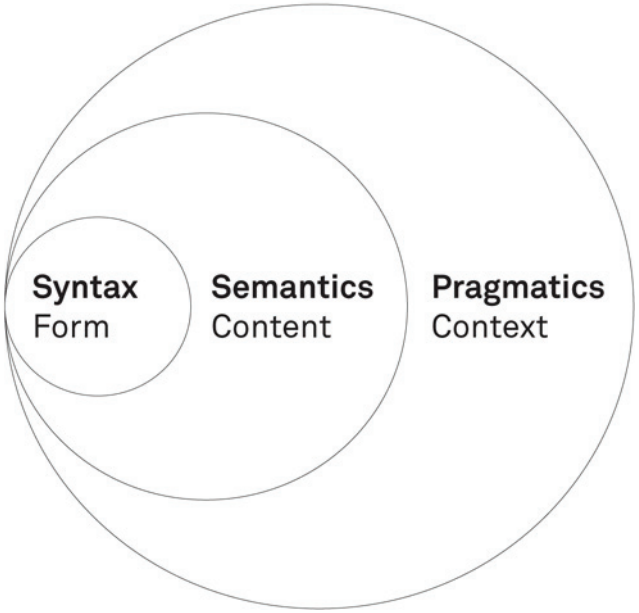
Projective architecture instead of a one-track reading, it has an openness that set into motion of possibility of multiple engagements rather than a single articulation of a program, technology, or form. The goal was an architecture, which could achieve an atmospheric interaction in which both the subject (e.g., designer) and the object (e.g, the project) carry and exchange information and energy (*Sandaker et al,* 2011).

CRITICAL ARCHITECTURE

Critical architecture is built around the belief that architecture stands in the critical position between being a cultural product and a discrete autonomous discipline. Michael Hays argued in his essay "*Critical Architecture: Between Culture and Form*" that critical architecture would operate between the extremes of conciliatory commodity and negative commentary (*Somol et al*, 2002: 73). Only critical architecture operated in his privileged '*between*' position that all architecture now automatically occupies a *de facto* critical status.

PROJECTIVE ARCHITECTURE

A projective architecture does not make a claim for expertise outside the field of architecture nor does it limit its field of expertise to an absolute definition of architecture (*Somol et al*, 2002: 75). Design is what keeps architecture from slipping into a cloud of heterogeneity. It delineates the fluctuating borders of architecture's discipline and expertise. Architects do not engage other topics as experts (e.g. economics, politics), but, rather as experts on design and how design may affect the other related topics (*Somol et al*, 2002: 77). Design encompasses object qualities (form, proportion, materiality, composition, etc.) but it also includes qualities of sensibility, such as effect, ambience and atmosphere.



METHODOLOGY	SYNTAX	>	SEMANTICS	>	(NEW) PRAGMATICS
IDEOLOGY	FORM	>	CONTENT	>	CONTEXT
PERIOD	MODERN	>	POSTMODERN	>	POST-POSTMODERN

THREE PHASES OF DESIGN
The first phase of modern design, born in the early twentieth century, was a search for a language of form that was plastic or mutable, a visual syntax that could be learned and thus disseminated rationally and potentially universally. Indeed, it is this inheritance of modernism that allows us to speak of a "visual language" of design at all. The values of simplification, reduction, and essentialism determine the direction of most abstract, formal design languages.

The second wave of design, born in the 1960s, focused on design's meaning making potential, its symbolic value, its semantic dimension and narrative potential, and thus was preoccupied with its essential content. This wave continued in different ways for several decades, reaching its apogee in graphic design in the 1980s and early 1990s, with the ultimate claim of "authorship" by designers (i.e., controlling content and thus form), and in theories about product semantics, which sought to embody in their forms the functional and cultural symbolism of objects and their forms. (Blauvert, 2008:4)

The third wave of design began in the mid-1990s and explores design's performative dimension: its effects on users, its pragmatic and programmatic constraints, its rhetorical impact, and its ability to facilitate social interactions. Like many things that emerged in the 1990s, it was tightly linked to digital technologies, even inspired by its metaphors (e.g., social networking, open source collaboration, interactivity), but not limited only to the world of zeroes and ones.'

RELATIONAL DESIGN

It is possible to identify architectural design as a specific discipline within the subject of architecture. Defined in this way, architecture can be described as a multidisciplinary subject (*Rendell*, 2007:2). Projective architecture creates theoretical framework for new kind of multidisciplinary architectural and design approach. As for the actual implementation of projective architecture, broad variation of design methods can be used. These include a method called Relational Design, which targets to create connection around surrounding aspects of design task.

The background of Relational Design is in art, when Nicolas Bourriaud coined the term relational aesthetics in the eponymous essay of 1998 to describe emerging trends seen in contemporary art of the 90's (*Holloway*, 2012). It centers round the artist using the relationship between the work and the audience as its primary basis. After that it has been used in other fields of design and architecture. Thus, relational design rather forms an extension to general framework of design methods than acts as method itself (see three phases of design on adjacent page).

Relational Design can be seen as a new form of design that goes beyond the realms of traditional and established forms of communication. The creation of dynamic and often unstable relationships between the design and the audience is the key differentiating quality of Relational Design, when combined to more traditional design methods (*Holloway*, 2012). It is concerned with performance or use, not as the natural result of some intended functionality but rather in the realm of behavior and '*uncontrollable sequences*'.

The design becomes generative, evolving in terms of a feedback loop: the output is fed back in as input, further stimulating the resulting output. This helps stimulate the desired uncontrollable consequences; as the inherent quality of a feedback loop is to induce behavior into seemingly simple systems. This resulting feedback loop will quickly introduce a non-linear narrative into the system. A generative work evolves over time, usually by the influence of the environment.

"Architecture is not an isolated or autonomous medium, it is actively engaged by the social, intellectual, and visual culture which is outside the discipline and which encompasses it... It is based on a premise that architecture is inevitably involved with questions more difficult than those of form or style." - Carol Burns & Robert Taylor (*Somol et al*, 2002: 73)

GIGAMAP

(SIMPLIFIED GIGAMAP)

THE PROJECT MATRIX

DATANET

(SINGLE DATA CONNECTIONS)

(LINE OF CONNECTIONS)

The following sequence of mappings related to the library design task is presented here starting from Gigamap. The next phases of mapping The Project Matrix and 'Datanets' are studied in the following pages.

DIAGRAMS AND DATA VISUAZATION

For a designer or an architect, the most fundamental task is to do the semantical task of turning ideas into something appreciable, i.e., words, sketches or images. In this task it is important to understand the prevailing conditions of the project for better understanding of the scope. For dealing with increasing complexity of world and related design tasks, there is need for new tools of data visualization.

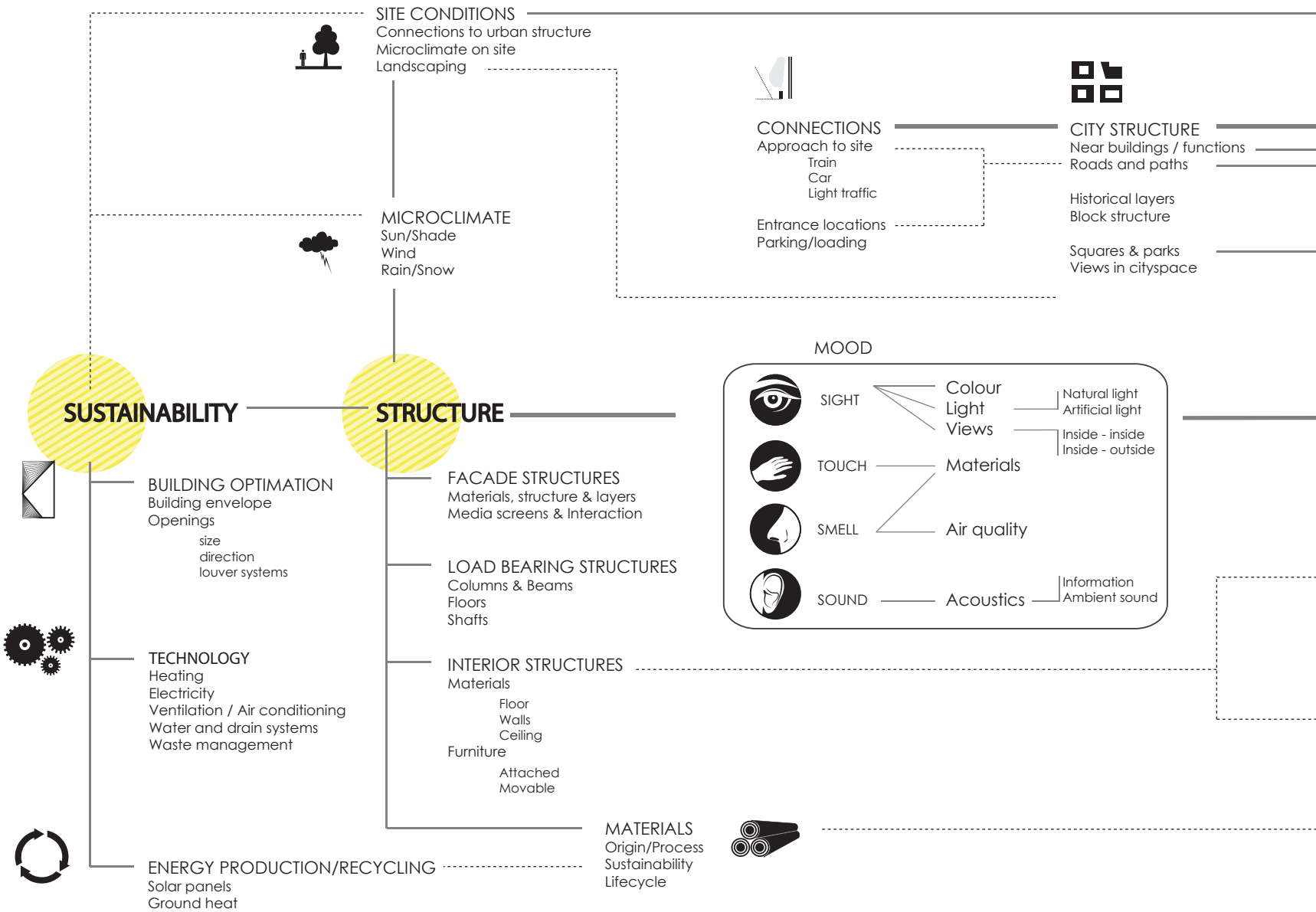
Usually data visualizations are presented as diagrams. A diagram is a two-dimensional geometric symbolic representation of information according to some visualization technique (*Klanten et al*, 2010: 7). The word graph is sometimes used as a synonym for diagram. Within just a few recent years, giving form to abstract data has become emergent possibility for designers and architects. It is possible to record data with GSP-devices, pedometers and other sensors, access databases from governments and other institutions, or use data generated in social networks. Almost anything can be turned into a graph.

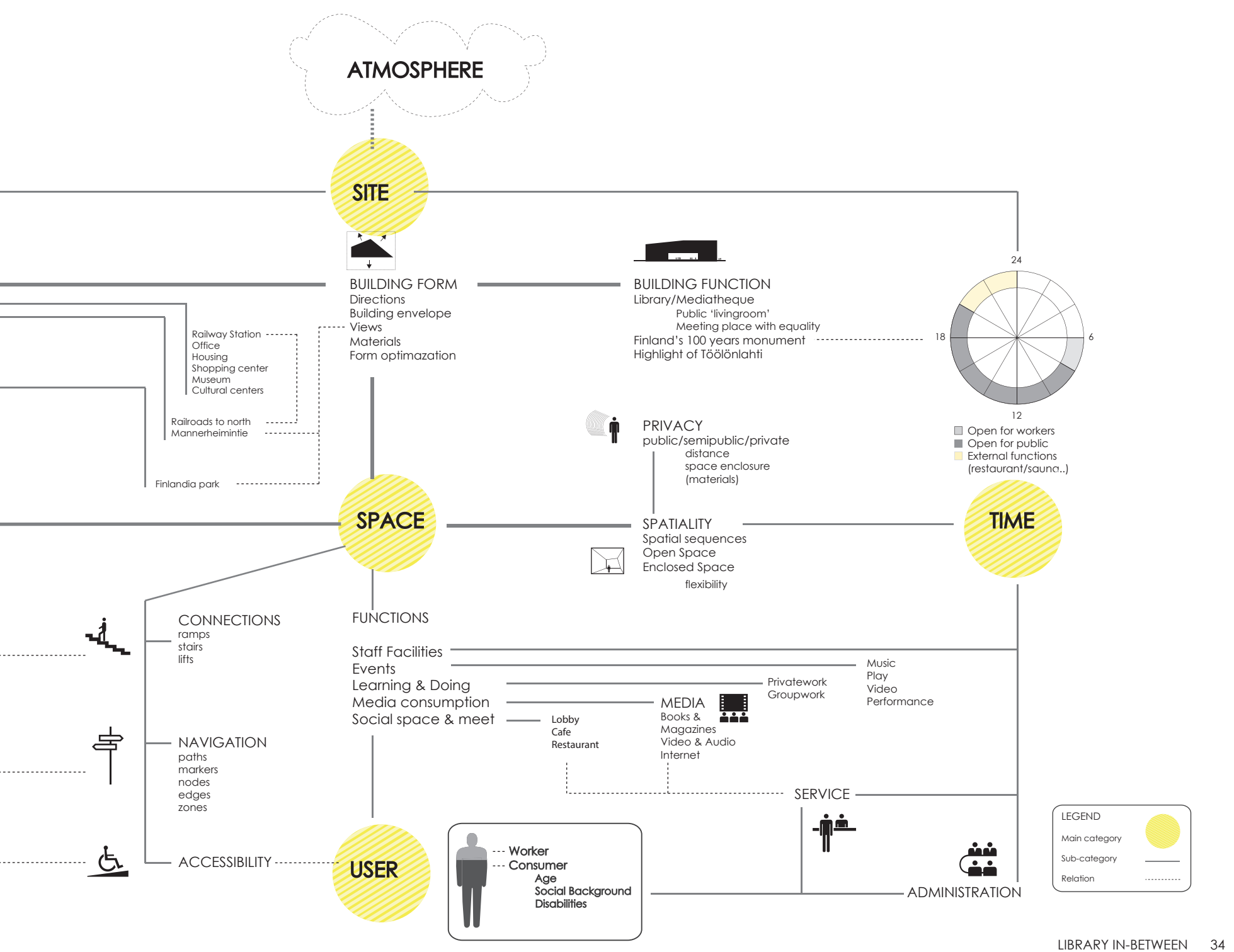
Diagram works primarily as a form of mediator; an external, found element, between the object and subject, which could be used to introduce new themes into a project. The diagrams tend to accentuate the effects of interaction between different actors. This relational approach to diagramming has generated new insights into the developmental potential (*Berkel et al*, 2006: 16).

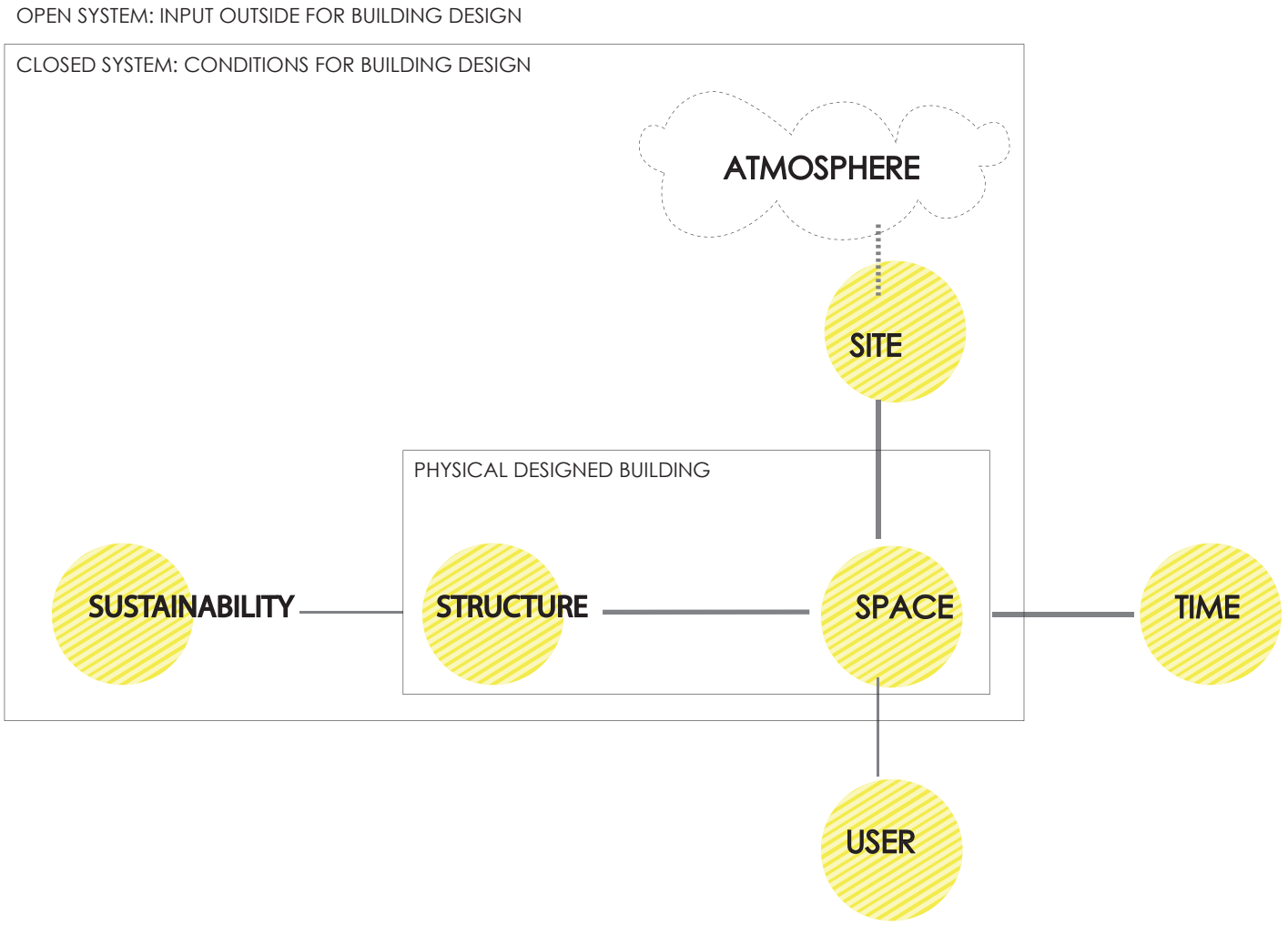
GIGA-MAPPING

Relatively new design method within the scope of relational design is called GIGA-mapping. It is embedded in this context of design, systems thinking and visualization. GIGA-mapping is creating an visual '*information cloud*' from which the designer can derive innovative solutions (*Sevaldson*, 2011). While mapping in general is a way of ordering and simplifying issues, GIGA-mapping intends not to tame any problems. GIGA-maps try to grasp, embrace the complexity of real life problems. Hence they are not resolved logically nor is the designer urge for order, simplicity or resolved logic allowed to take over too much and hence bias the interpretation of reality.

While information graphics are mostly occupied with communicating information to a passive audience, visualization in GIGA-mapping intends to be applied in processes as well as for communication and involves participation and collective production of information.


SITE CONDITIONS
Connections to urban structure
Microclimate on site
Landscaping
MICROCLIMATE
Sun/Shade
Wind
Rain/Snow
CONNECTIONS
Approach to site
Train
Car
Light traffic
Entrance locations
Parking/loading
CITY STRUCTURE
Near buildings / functions
Roads and paths
Historical layers
Block structure
Squares & parks
Views in cityspace
SUSTAINABILITY
STRUCTURE
MOOD
SIGHT
Colour
Light
Views
Natural light
Artificial light
Inside - inside
Inside - outside
TOUCH
Materials
SMELL
Air quality
SOUND
Acoustics
Information
Ambient sound
BUILDING OPTIMATION
Building envelope
Openings
size
direction
louver systems
FACADE STRUCTURES
Materials, structure & layers
Media screens & Interaction
LOAD BEARING STRUCTURES
Columns & Beams
Floors
Shafts
INTERIOR STRUCTURES
Materials
Floor
Walls
Ceiling
Furniture
Attached
Movable
TECHNOLOGY
Heating
Electricity
Ventilation / Air conditioning
Water and drain systems
Waste management
MATERIALS
Origin/Process
Sustainability
Lifecycle
ENERGY PRODUCTION/RECYCLING
Solar panels
Ground heat


ATMOSPHERE
SITE
BUILDING FORM
Directions
Building envelope
Views
Materials
Form optimazation
Railway Station
Office
Housing
Shopping center
Museum
Cultural centers
Railroads to north
Mannerheimintie
Finlandia park
BUILDING FUNCTION
Library/Mediatheque
Public 'livingroom'
Meeting place with equality
Finland's 100 years monument
Highlight of Töölönlahti
24
18
6
12
Open for workers
Open for public
External functions
(restaurant/sauna..)
PRIVACY
public/semipublic/private
distance
space enclosure
(materials)
SPACE
SPATIALITY
Spatial sequences
Open Space
Enclosed Space
flexibility
TIME
CONNECTIONS
ramps
stairs
lifts
FUNCTIONS
Staff Facilities
Events
Learning & Doing
Media consumption
Social space & meet
Music
Play
Video
Performance
Privatework
Groupwork
MEDIA
Books &
Magazines
Video & Audio
Internet
Lobby
Cafe
Restaurant
NAVIGATION
paths
markers
nodes
edges
zones
SERVICE
ACCESSIBILITY
USER
Worker
Consumer
Age
Social Background
Disabilities
ADMINISTRATION
LEGEND
Main category
Sub-category
Relation


OPEN SYSTEM: INPUT OUTSIDE FOR BUILDING DESIGN
CLOSED SYSTEM: CONDITIONS FOR BUILDING DESIGN
ATMOSPHERE
SITE
PHYSICAL DESIGNED BUILDING
SUSTAINABILITY
STRUCTURE
SPACE
TIME
USER

LIBRARY DESIGN PROCESS

The GIGA-map, presented on previous spread, maps the relation with the most relevant elements of design process of public library design. Design mapping could be applied as general public building design, while it is connected to the site with such elements as microclimate, atmosphere, city structure, etc. The main target of mapping is to visualize effect between different factors of design. While making decisions in design, the mapping visualizes the effects on other factors of design. In this mapping issues related with politics, money and related substances are not included to analysis.

Simplified GIGA-map is presented in the adjacent page. This mapping will emphasize the main elements of design by forming the distinction between the integral conditions of BUILDING DESIGN, and external elements such as TIME and USER.

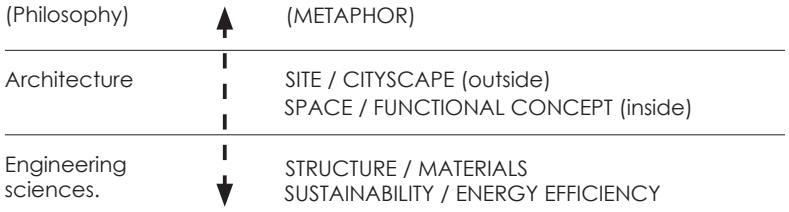
SITE 	BUILDING FUNCTION Library/Mediatheque Public 'livingroom' Meeting place Finland's 100y building Highlight of Töölönlahti	CITY STRUCTURE Near buildings / functions Roads and paths Historical layers Block structure Squares & parks Views in cityspace	CONNECTIONS Approach to site Light traffic Car/Train Entrance locations Parking/loading	BUILDING FORM Directions Building envelope Views Materials Form optimization	MICROCLIMATE Sun/Shade Wind Rain/Snow
SPATIALITY 	FUNCTIONS Staff Facilities Events Learning & Doing Media consumption Social & meeting space	SPATIALITY Spatial sequences Flexibility Open Space Enclosed Space	CONNECTIONS Ramps Stairs Lifts NAVIGATION ACCESSIBILITY	PRIVACY Public/semipublic/private Distance Volume Space enclosure (materials)	MOOD Colour Light Views Materials Air quality Acoustics
SUSTAINABILITY 	SITE CONDITIONS Connections to (urban structure) Microclimate Landscaping	BUILDING OPTIMIZATION Building envelope Openings Size Direction Louver systems	MATERIALS Origin/Process Sustainability Lifecycle	TECHNOLOGY Heating Electricity Ventilation/air cond. Water and drain systems Waste management	ENERGY PRODUCTION/ RECYCLING Solar panels Ground heat
STRUCTURE 	FACADE STRUCTURES Materials (structure & layers) Media screens	BEARING STRUCTURES Columns & Beams Floors Shafts	INTERIOR STRUCTURES Materials Floor Wall Ceiling Furniture Attached Movable		

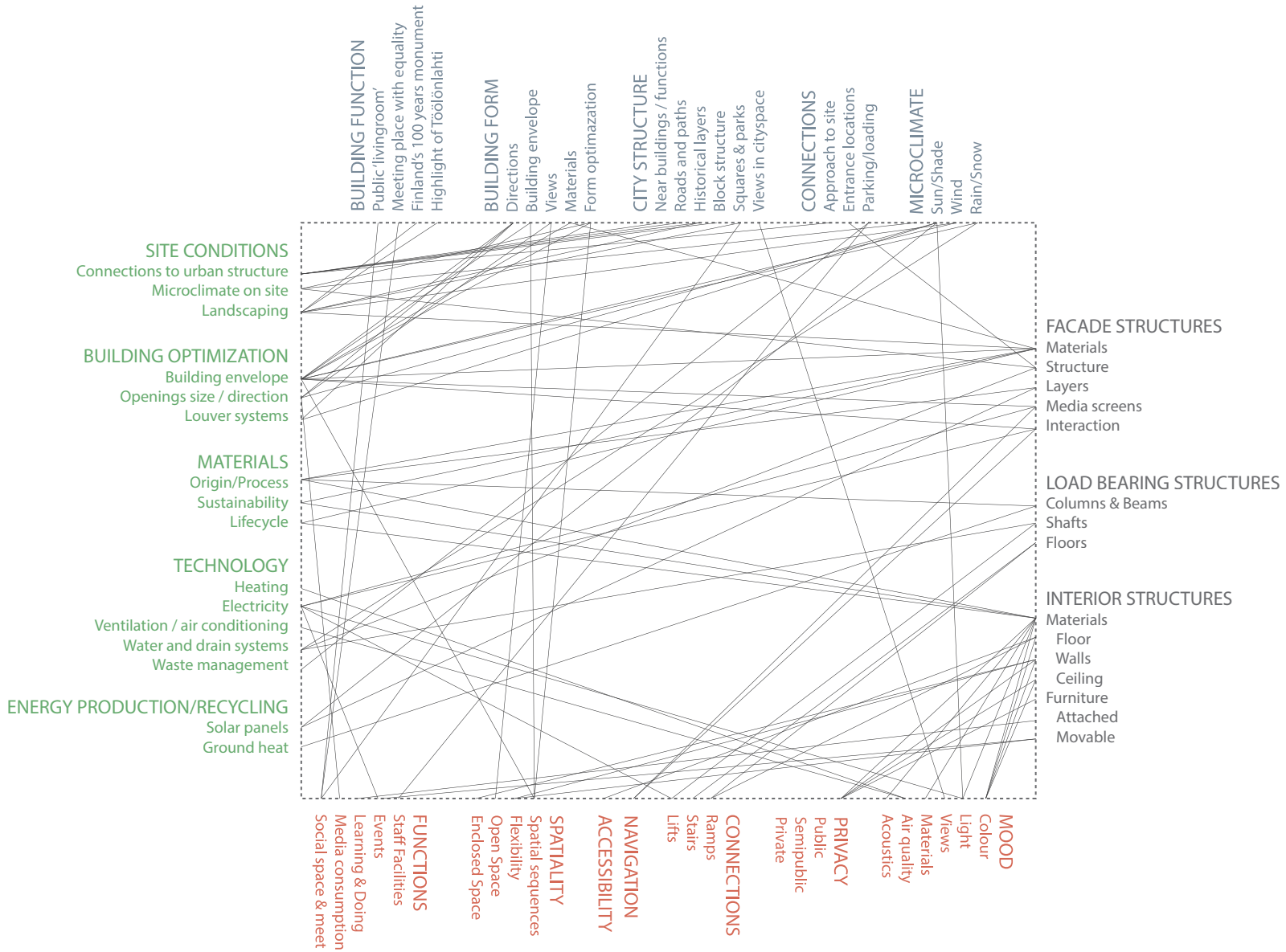
THE PROJECT MATRIX

From previously presented GIGA-map the elements of library design are arranged into the matrix. In The Project Matrix, the elements of library design are opened as sub-categories of building design. In the following diagrams, the connections between these elements are visualized. The matrix is divided into four main categories: Site/Cityscape, Spatiality/Functional Concept, Structure / Materials and Sustainability / Energy Efficiency. All the main elements of The Project Matrix are studied in the Chapter 3.

Essential element or the fifth main category for The Project Matrix is Atmosphere, which can be seen as 'the superior category' of design that forms ambient framework for the design project. The actual architecture creates an envelope between the elements existing on the site and the space inside the building, which is formed by different structures and materials for construction. The decisions made in building design are guided by criteria of sustainability among the other factors. Sustainability can be seen as de facto element in current building design.

Structures and sustainability, as such, are rather to be considered to be part of engineering sciences rather than architecture, even though there is no physical architecture without structures.




BUILDING FUNCTION
Public 'livingroom'
Meeting place with equality
Finland's 100 years monument
Highlight of Töölönlahti
BUILDING FORM
Directions
Building envelope
Views
Materials
Form optimazation
CITY STRUCTURE
Near buildings / functions
Roads and paths
Historical layers
Block structure
Squares & parks
Views in cityspace
CONNECTIONS
Approach to site
Entrance locations
Parking/loading
MICROCLIMATE
Sun/Shade
Wind
Rain/Snow
SITE CONDITIONS
Connections to urban structure
Microclimate on site
Landscaping
BUILDING OPTIMIZATION
Building envelope
Openings size / direction
Louver systems
MATERIALS
Origin/Process
Sustainability
Lifecycle
TECHNOLOGY
Heating
Electricity
Ventilation / air conditioning
Water and drain systems
Waste management
ENERGY PRODUCTION/RECYCLING
Solar panels
Ground heat
FACADE STRUCTURES
Materials
Structure
Layers
Media screens
Interaction
LOAD BEARING STRUCTURES
Columns & Beams
Shafts
Floors
INTERIOR STRUCTURES
Materials
Floor
Walls
Ceiling
Furniture
Attached
Movable
FUNCTIONS
Staff Facilities
Events
Learning & Doing
Media consumption
Social space & meet
SPATIALITY
Spatial sequences
Flexibility
Open Space
Enclosed Space
NAVIGATION
ACCESSIBILITY
CONNECTIONS
Ramps
Stairs
Lifts
PRIVACY
Public
Semipublic
Private
MOOD
Colour
Light
Views
Materials
Air quality
Acoustics

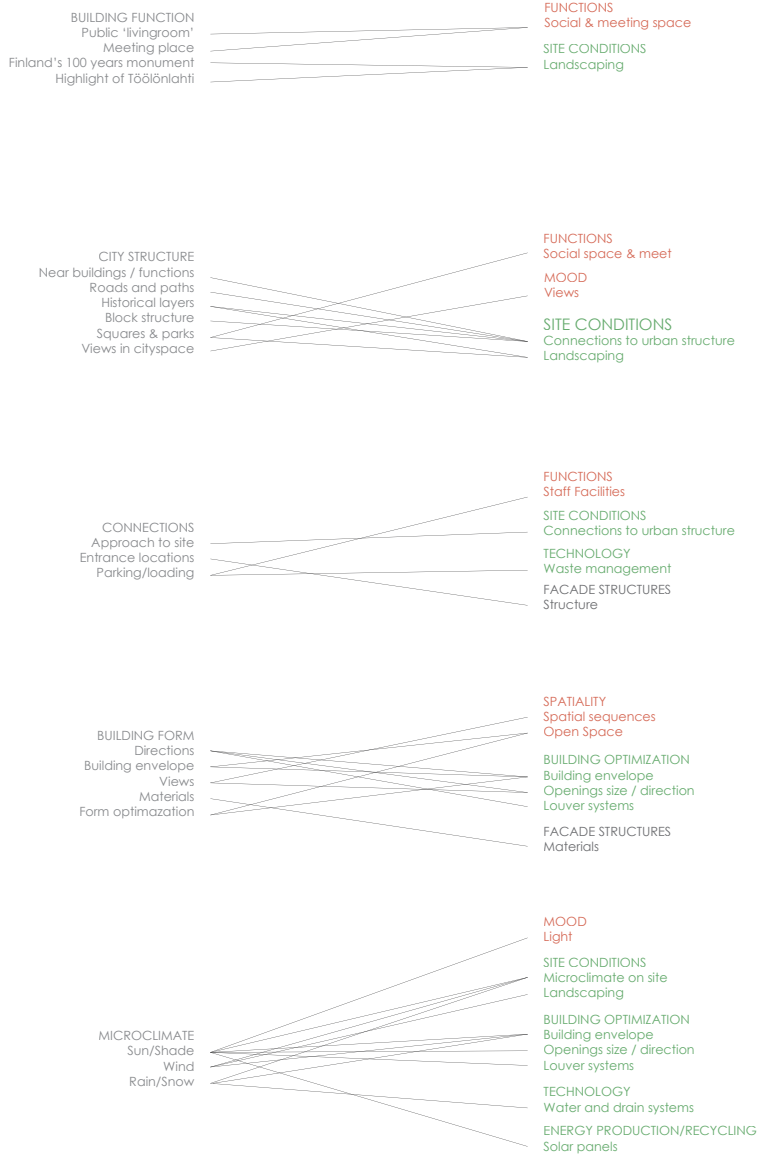
DATANETS
(of the project matrix)

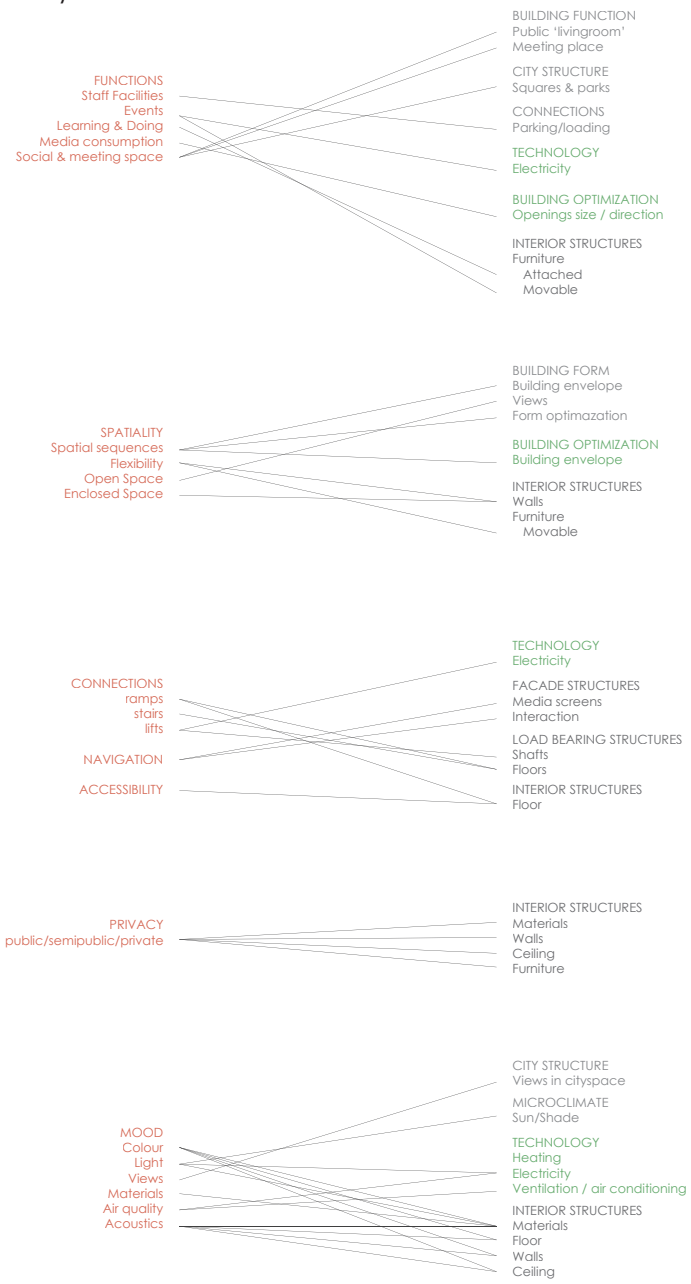
In the design process, the elements of The Project Matrix are further elaborated as Datanets. Sometimes information is not to found in the single data record of itself, but in its connection and relation to others. By connecting these data points, a network structure emerges where the links tell us more than the nodes. The following diagrams visualize these relations and associations of The Project Matrix. It gets also closer of the actual decision making in the design project when compared to more linear approach.

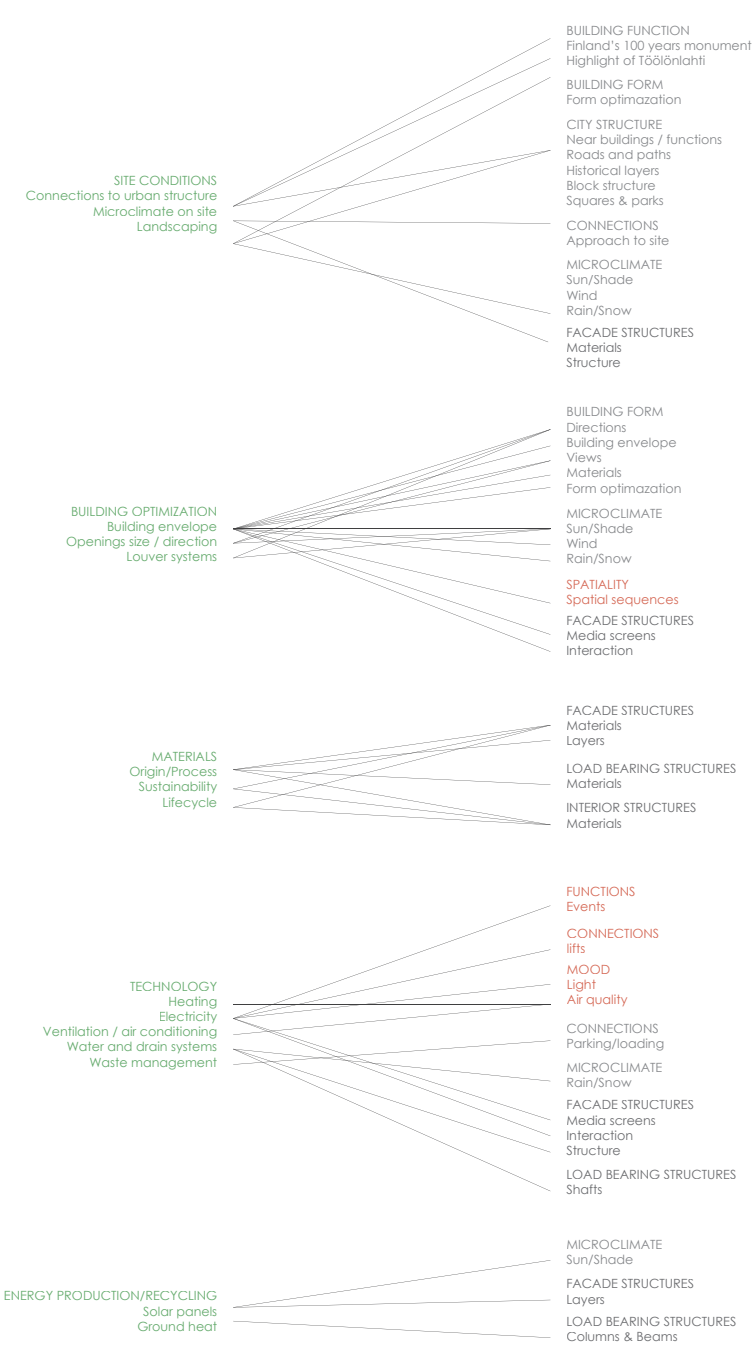
In the following pages The Datanet (of project matrix) is further divided to type relations of sub-categories of The Project Matrix. These realizations are used, in the Chapter 3: Project as a process, as footnote reference of each design element to visualize the connection point to rest of the project.

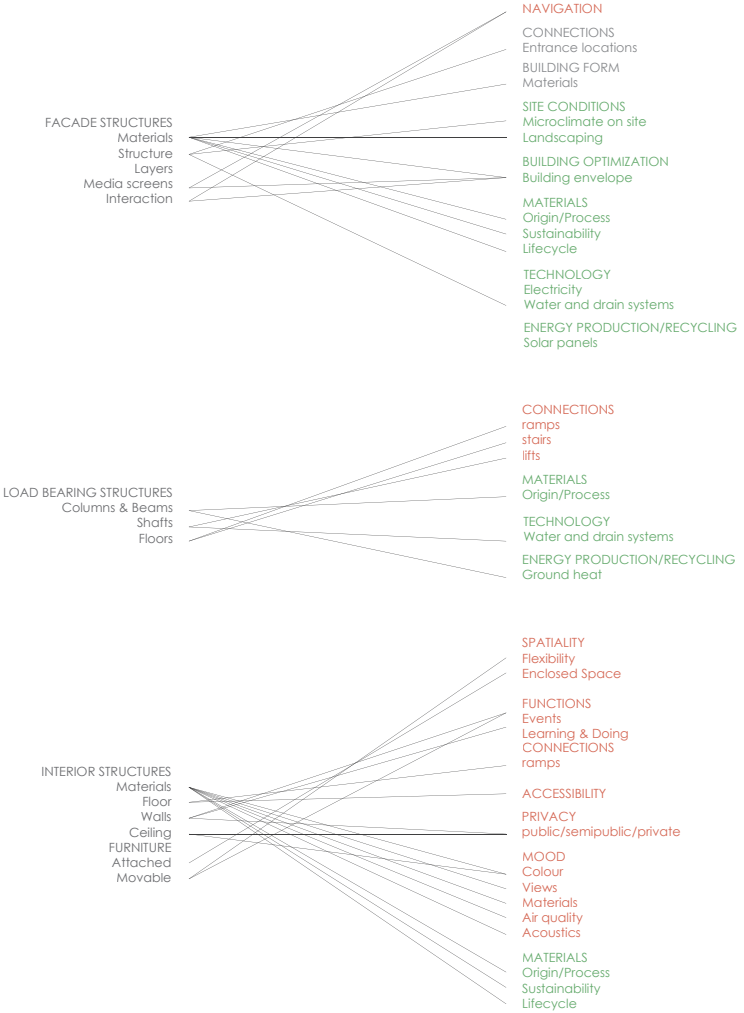
As an outcome of separated type relations mapping is weighted between elements of four main categories of The Project Matrix. As the final examination of relations the matrix are adjusted as line format (pages 46-47).

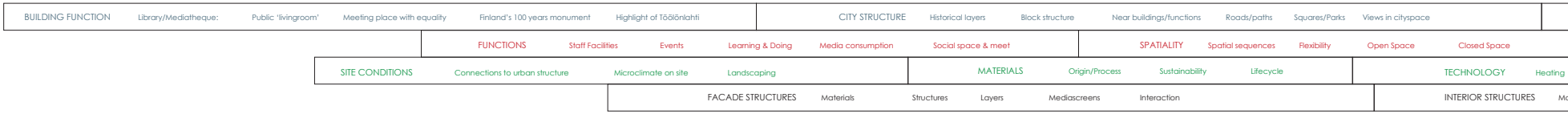
GIGAMAP | PROJECT MATRIX | DATANET | SINGLE CONNECTIONS (of datanet)






SITE CONDITIONS
Connections to urban structure
Microclimate on site
Landscaping
BUILDING FUNCTION
Finland's 100 years monument
Highlight of Töölönlahti
BUILDING FORM
Form optimazation
CITY STRUCTURE
Near buildings / functions
Roads and paths
Historical layers
Block structure
Squares & parks
CONNECTIONS
Approach to site
MICROCLIMATE
Sun/Shade
Wind
Rain/Snow
FACADE STRUCTURES
Materials
Structure
BUILDING OPTIMIZATION
Building envelope
Openings size / direction
Louver systems
BUILDING FORM
Directions
Building envelope
Views
Materials
Form optimazation
MICROCLIMATE
Sun/Shade
Wind
Rain/Snow
SPATIALITY
Spatial sequences
FACADE STRUCTURES
Media screens
Interaction
MATERIALS
Origin/Process
Sustainability
Lifecycle
FACADE STRUCTURES
Materials
Layers
LOAD BEARING STRUCTURES
Materials
INTERIOR STRUCTURES
Materials
TECHNOLOGY
Heating
Electricity
Ventilation / air conditioning
Water and drain systems
Waste management
FUNCTIONS
Events
CONNECTIONS
lifts
MOOD
Light
Air quality
CONNECTIONS
Parking/loading
MICROCLIMATE
Rain/Snow
FACADE STRUCTURES
Media screens
Interaction
Structure
LOAD BEARING STRUCTURES
Shafts
ENERGY PRODUCTION/RECYCLING
Solar panels
Ground heat
MICROCLIMATE
Sun/Shade
FACADE STRUCTURES
Layers
LOAD BEARING STRUCTURES
Columns & Beams


FACADE STRUCTURES
Materials
Structure
Layers
Media screens
Interaction
NAVIGATION
CONNECTIONS
Entrance locations
BUILDING FORM
Materials
SITE CONDITIONS
Microclimate on site
Landscaping
BUILDING OPTIMIZATION
Building envelope
MATERIALS
Origin/Process
Sustainability
Lifecycle
TECHNOLOGY
Electricity
Water and drain systems
ENERGY PRODUCTION/RECYCLING
Solar panels
LOAD BEARING STRUCTURES
Columns & Beams
Shafts
Floors
CONNECTIONS
ramps
stairs
lifts
MATERIALS
Origin/Process
TECHNOLOGY
Water and drain systems
ENERGY PRODUCTION/RECYCLING
Ground heat
INTERIOR STRUCTURES
Materials
Floor
Walls
Ceiling
FURNITURE
Attached
Movable
SPATIALITY
Flexibility
Enclosed Space
FUNCTIONS
Events
Learning & Doing
CONNECTIONS
ramps
ACCESSIBILITY
PRIVACY
public/semipublic/private
MOOD
Colour
Views
Materials
Air quality
Acoustics
MATERIALS
Origin/Process
Sustainability
Lifecycle


BUILDING FUNCTION
Library/Mediatheque:
Public 'livingroom'
Meeting place with equality
Finland's 100 years monument
Highlight of Töölönlahti
CITY STRUCTURE
Historical layers
Block structure
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Staff Facilities
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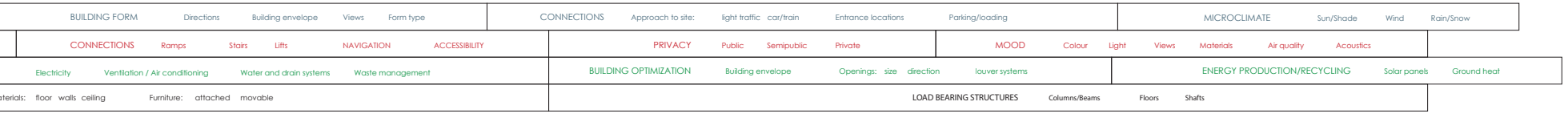
Learning & Doing
Media consumption
Social space & meet
SPATIALITY
Spatial sequences
Flexibility
Open Space
Closed Space
SITE CONDITIONS
Connections to urban structure
Microclimate on site
Landscaping
MATERIALS
Origin/Process
Sustainability
Lifecycle
TECHNOLOGY
Heating
FACADE STRUCTURES
Materials
Structures
Layers
Mediascreens
Interaction
INTERIOR STRUCTURES

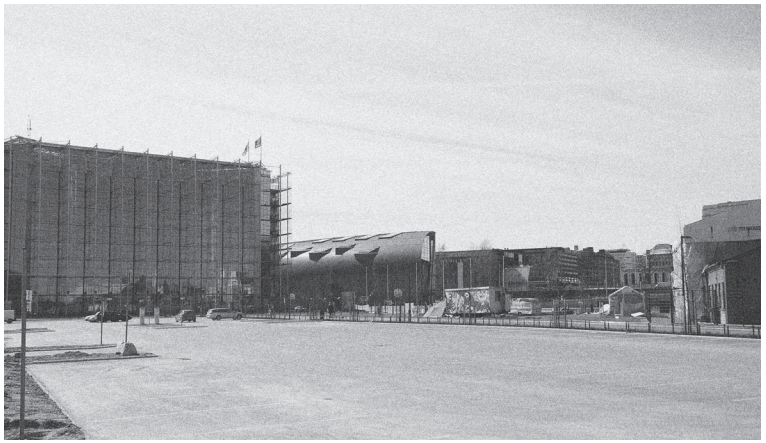

BUILDING FORM Directions Building envelope Views Form type
CONNECTIONS Approach to site: light traffic car/train Entrance locations Parking/loading
MICROCLIMATE Sun/Shade Wind Rain/Snow
CONNECTIONS Ramps Stairs Lifts NAVIGATION ACCESSIBILITY
PRIVACY Public Semipublic Private
MOOD Colour Light Views Materials Air quality Acoustics
Electricity Ventilation / Air conditioning Water and drain systems Waste management
BUILDING OPTIMIZATION Building envelope Openings: size direction louver systems
ENERGY PRODUCTION/RECYCLING Solar panels Ground heat
terials: floor walls ceiling Furniture: attached movable
LOAD BEARING STRUCTURES Columns/Beams Floors Shafts

In this Chapter 3, the main elements of project that were previously presented in the mappings of library design are used as seminal way of presenting '*The Project as Process*'. The project itself is formed by relations presented in The Project Matrix. The relations are essential for reasoning choices made in design and justification. The presentation method of the project is based on extensive use of data visualization and diagrams. The related elements of each topic in the matrix are displayed on the footer.

3

THE PROJECT AS PROCESS

ITERATIVE DESIGN PROCESS



ATMOSPHERE OF SITE

The character of a space or place is not merely a visual quality as usually assumed. The judgement of environmental character is a complex fusion of countless factors which are immediately grasped as an overall atmosphere, feeling, mood, or ambience. The immediate judgement of the character of a space calls for our entire embodied and existential sense, and it is perceived in a diffuse and peripheral manner rather than through precise and conscious observation. There is a close relation between atmosphere and *Genius Locii*, which can be conceived as atmosphere of the place (*Pallasmaa*, 5/2011: 18).

Also creative search is based on vague, polyphonic, and mostly unconscious ways of perception and thought instead of focused and unambiguous attention (*Pallasmaa*, 5/2011: 18). Unconscious and unfocused creative scanning grasps complex entities and processes, without conscious understanding of any of the elements, much in the way atmospheres are perceived.

METAPHOR

When moving from atmosphere towards creation and design, the notion of Metaphor is usually grasped. Metaphor (metaphor of architecture) is defined as, "*a figure of speech in which a word or phrase is applied to an object or action to which it is not literally applicable*" (*Pallasmaa*, 2011: 68). In other words, metaphor defines a mental image of architectural structures, which are simultaneously utilitarian constructions for specific purposes, and spatial and material images of our being-in-the-world.

When explored, what forms and shapes the built environment consists of and why one building seems better than the next, metaphor is in a key role. As a key to the built environment, metaphor is the answer which not only shapes the built environment but the means by which we read what is formed. With metaphor as the gestalt, design embraces the whole. The whole of the architectural metaphor is structured in such a way as to clarify, orient and provide reification of all the design parameters into a highly structured work. Metaphor is an eye-opener and mental guide to understanding and use of the built environment.

Too often there is not enough thought and consideration paid on metaphor. What (metaphor) is the designed building or what it should be? What is the message of the designed building? The site of the Helsinki Central Library displayed in the images on left are creating a certain unique atmosphere.

BUILDING FUNCTION

Public space can be divided into four groups according to ownership and access: privately owned with or without public access and publicly owned with or without public access. Not all publicly owned spaces are open to public (such as, bureaus, foundations etc.), either not all privately owned spaces cannot be accessed by public (such as, shopping centers, movie theaters, etc.). The critical terms of defining access is the group of authority, which is usually determined by the ownership and power (*Ridell et al*, 2009: 19).

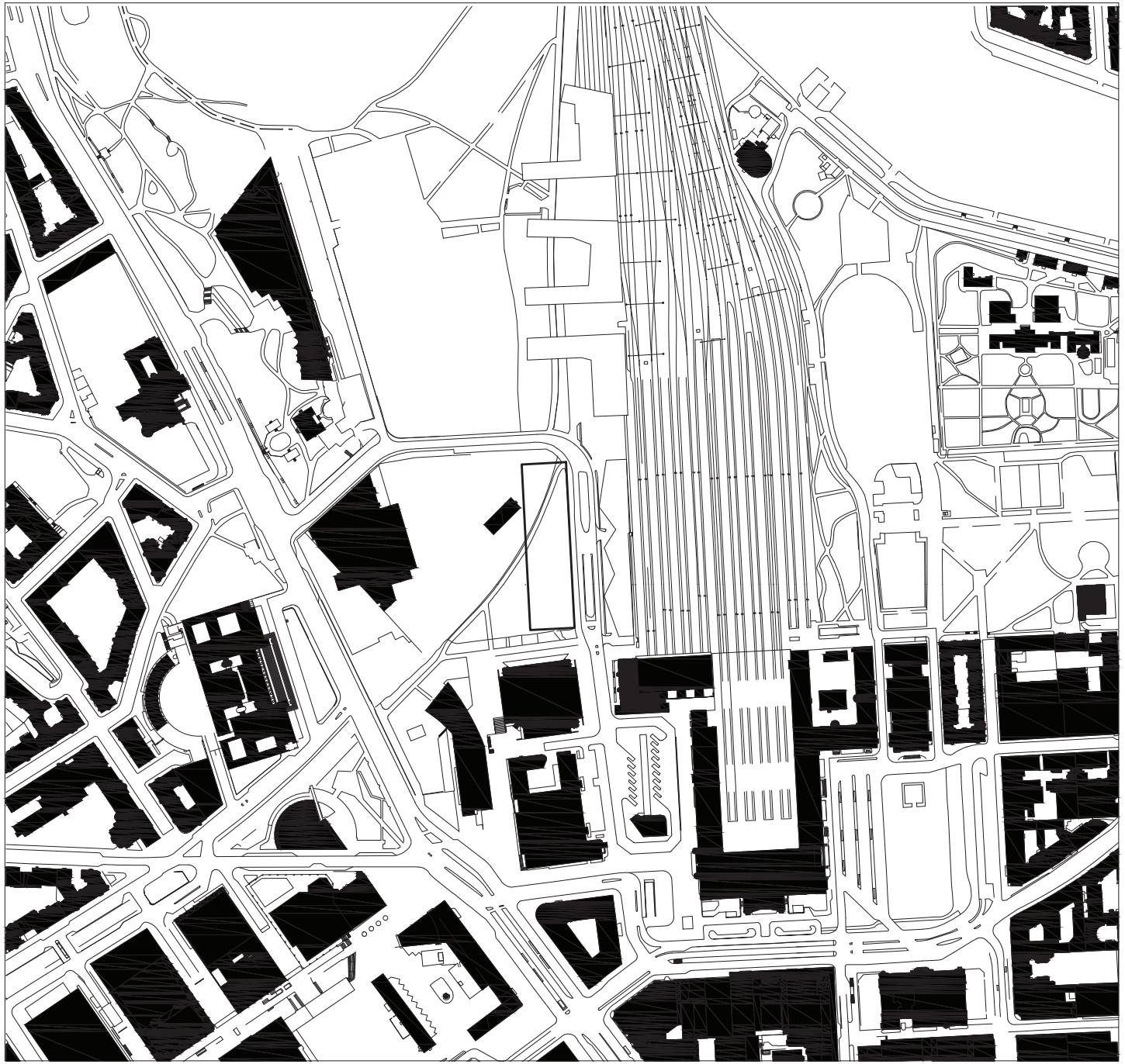
The commercialization of public space has become a more prominent social concern in recent years. As advertisers have competed for the increasingly fleeting attention of consumers, they have found increasing amount of venues for their commercial messages.

Public libraries are one of the few institutions, which are expected to be serving a public good with the promotion of social equality. Library is part of public space, which includes both inside space and the space surrounding it. On the site of Töölönlahti the public library serves a special role of supporting the public space and parks in very closeness.

"Architecture's last function will be the creation of the symbolic spaces that accommodate the persistent desire for collectivity." - Rem Koolhaas (*Koolhaas*, 1997: 604)

In addition to general guidelines, for Helsinki Central Library has been set with the target of being the 'heart' of Töölönlahti and become a celebratory project marking the centenary anniversary of Finnish independence (*competition program*, 26). The completion of the building for the anniversary is expected to happen in year 2017.

Related subjects of The Project Matrix:
Functions
Site conditions



CITY STRUCTURE

Cityscape and site properties are defining the relation of building to its surroundings. The essential elements for building design are at least, building mass, shape, size and placement, and facade materials and organization. The architect should always look for clues and signs of the environment, which are already present in place, and that allows past, present and future to be balanced the way that is appropriate to site and atmosphere. These elements relate the building to the surrounding site and city structure.

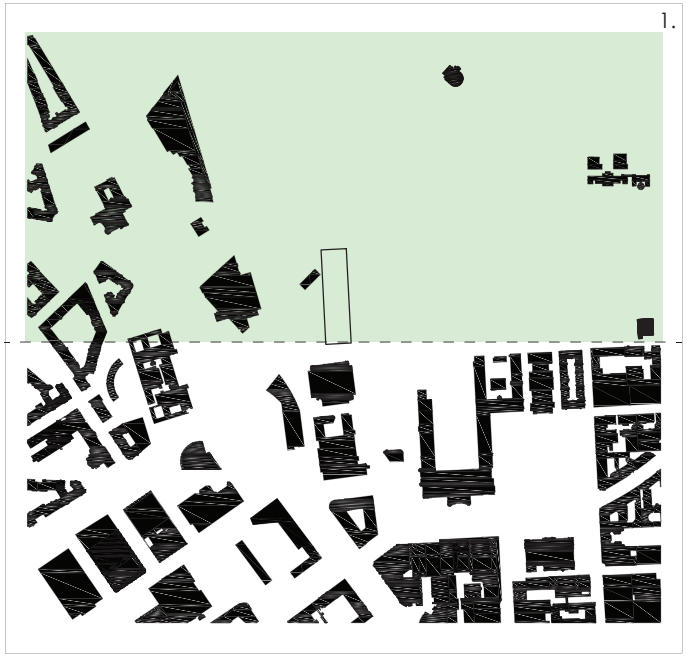
The city structure is formed by three basic urban elements, which are *the armature, the enclave,* and *the heterotopia*. The enclave creates node structures, and highlights to city, such as remarkable buildings, squares and open areas. The armature, works as '*a linear organizing device*' between node structures (*Shane*, 2005:13). The main armature elements, such as streets, works as the main connecting element in the city. The third element, heterotopia can be a single real place that juxtaposes several spaces. It creates shifts in style and composition, and it marks layers in the city structure. Heterotopia plays a key role both stabilizing city and in catalyzing transformations from one city model to another.

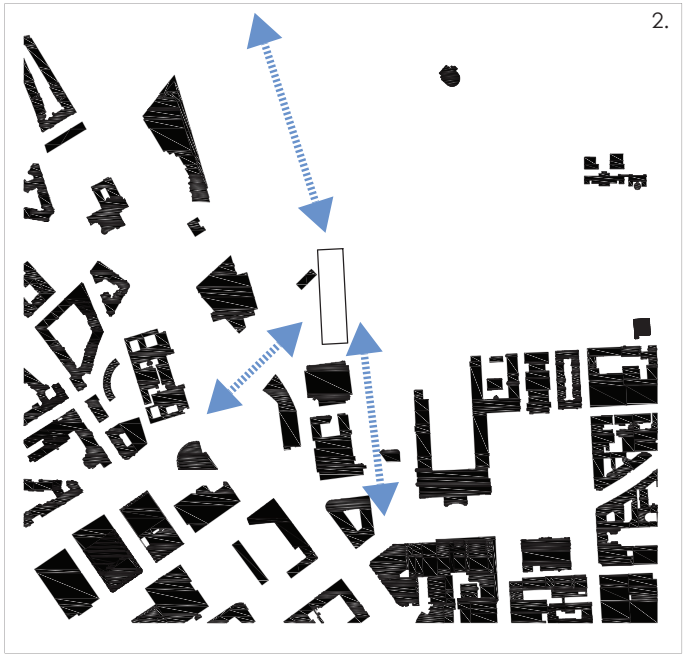
The armature, the enclave, and the heterotopia are the basic components of any city, constantly combined and recombined in different cultures, places and periods (*Shane*, 2005: 211).

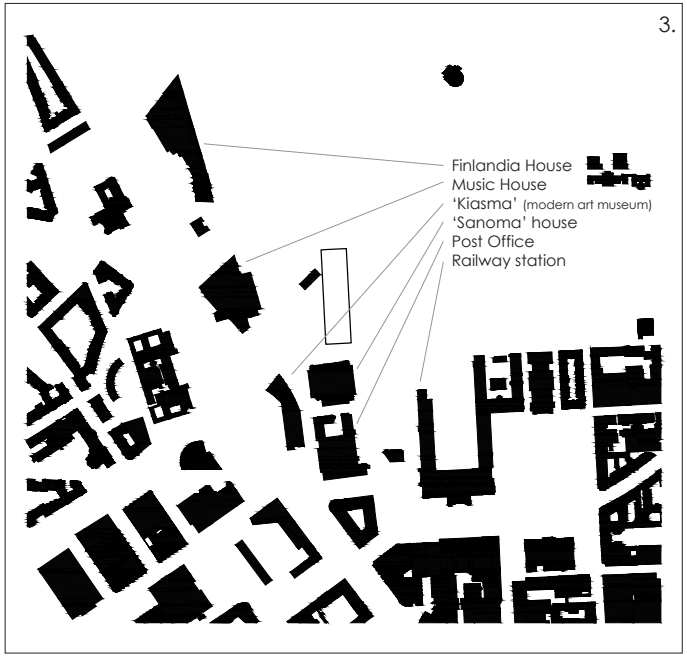
The site for Helsinki Central Library is located in the middle of Helsinki. The actual city structure is dominated by closed blocks to south and west and park areas to north. Symbolically, it is the space in-between the city and 'rest of the Finland' (the railway connects the site to other towns in Finland).

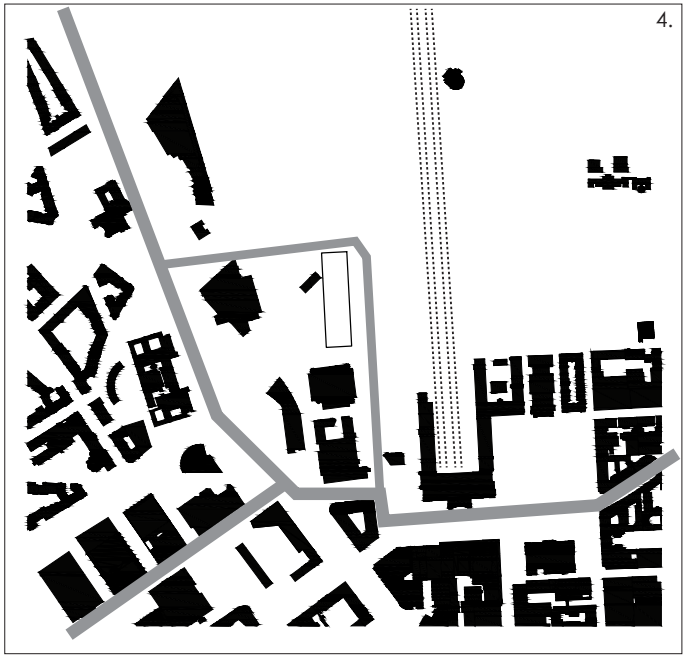
Functions (building) Mood

Site connections


1.


2.


3.
Finlandia House
Music House
'Kiasma' (modern art museum)
'Sanoma' house
Post Office
Railway station


4.

CONNECTIONS

The site is connected to the surrounding urban fabric by armatures, i.e., the connections accessing it. These include all types of connections: pedestrian, light traffic, public traffic and vehicle connections. The connections are creating flows to city structure. Manuel Castells describes the modern world as '*a space of flows*', which consists flows of information, communication, ideas, money, people, etc. The space of flows is the material organization of time-sharing social practices that work through flows (*Castells*, 1999: 295). Space is the physical support of the way people live in time.

The flows have critical role of setting the guidelines to the prevailing city structure. They define the pace and system people in town are accustomed to.

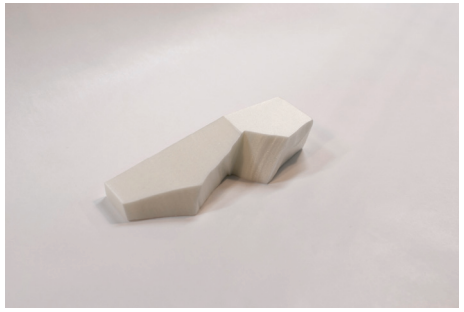
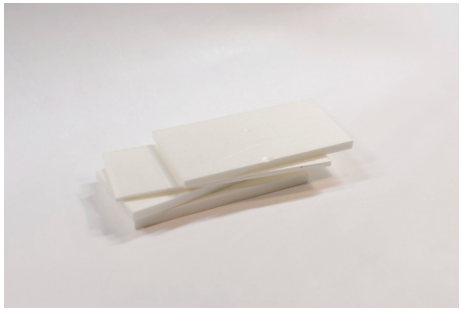
The connections, flows and structures related to the site are depicted by four diagrams, in the following:

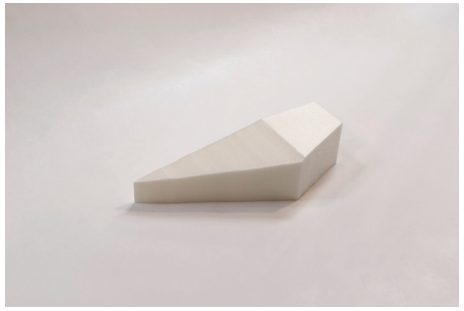
1. The division between park areas and closed city structure. The near surroundings are consisted of closed block structure to the west and south. On the side of north area is surrounded by park and water areas.

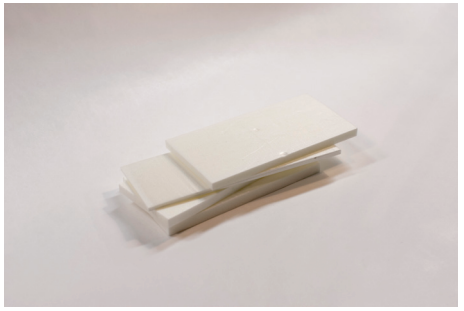
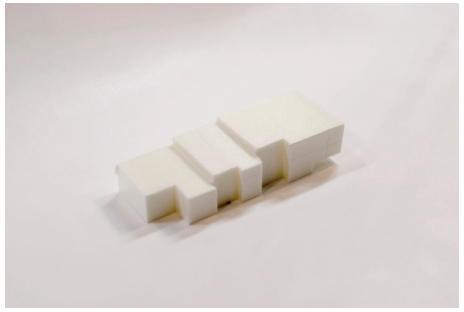
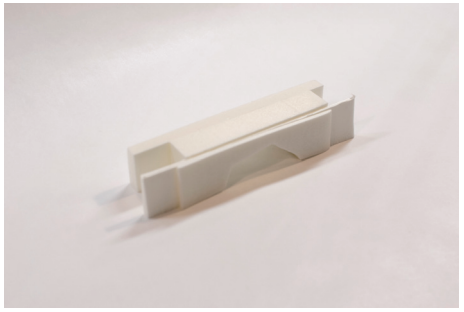
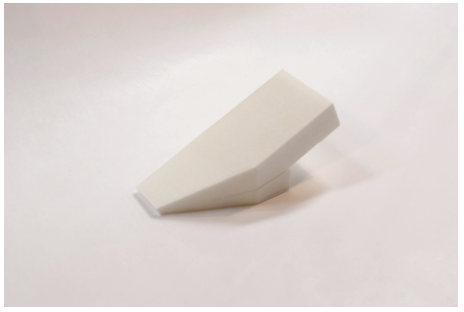
2. Views to site are presented in this diagram. The longest views are obtained to the side of Finlandia Park. From the side of the city one of the most important views is the view along railway station.

3. The currently existing major buildings are presented. Most of them are public cultural buildings.

4. The main connections to site (library) are presented in the diagram. These connections include railway connection to north and road connection from east-to-west.



BUILDING FORM

In the design process, the most fundamental stage of design is finding the actual form or shape of the building. In this phase, architects ideas are actualized into drawings, sketches, models, and diagrams. Working with this preliminary material is often deals with an iterative process. For example, in the Alvar Aalto's atelier the shift in drawing from Aalto's sketches to the secondary drawings and models was considered constant iteration and play between the two phases (*Charrington*, 2011: 90).

FORM-MAKING/ FORM-FINDING

With current methods of design the study of designed form is divided into two methods. The distinction between '*form-making*' and '*form-finding*' is defined as follows: form-making, loosely defined, is a process of inspiration and refinement (form precedes analysis of programmatic influences and design constraints) versus form-finding as a process of discovery and editing (form emerges from parametric analysis) (*DCC 08*, 2008).

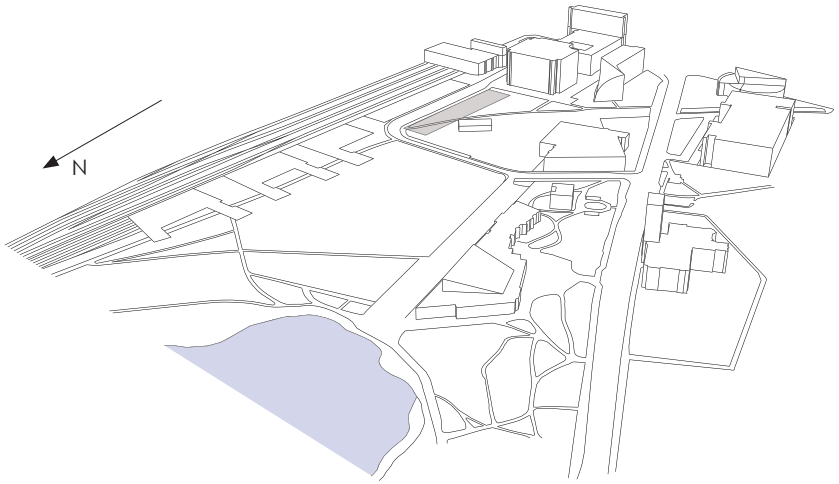
Cases or methodologies in which mental construct arises first are labeled form-making: Designers ideas are sketched or otherwise represented for testing against programmatic influences and role as tools, and if representations embody a necessary component of knowing, then knowing is determined or constrained by the choice of representation. The knowing is here determened by the design constraints defined by the task or designer itself. Form-making with no or little connections to prevailing connections of the site is not really architecture but rather sculpture - form without function.

In form-finding, the designer defines a number of critical parameters and material characteristics, upon which the material system settles into the equilibrium state by itself taking on its specific shape in the process. This design method of form finding, as Frei Otto called it, is profoundly different from the still prevalent form making (*Hensel et al*, 2006: 53). Extreme form-finding also is rather applied engineering - form exclusively determined by function. Known architectural design methodologies fall between these extremes. Although not intended for architectural criticism, it can be argued from this position that many canonical works result from design processes optimally balancing form-making and form-finding.

Spatiality

Building optimization

Facade structures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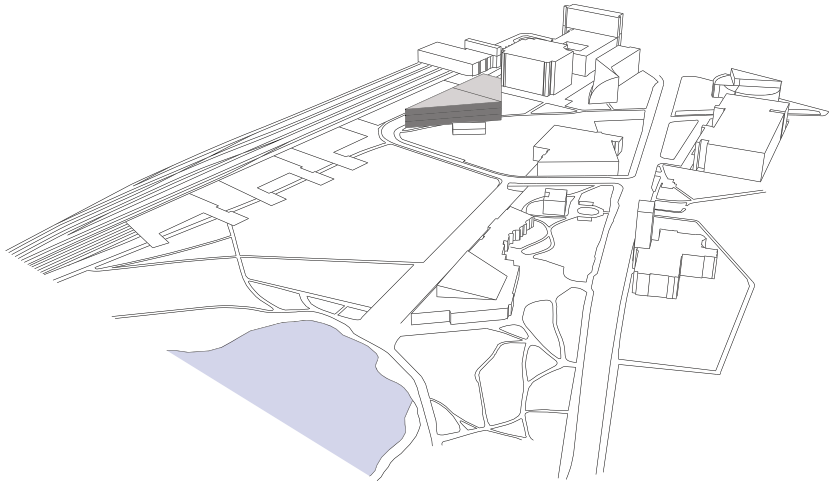
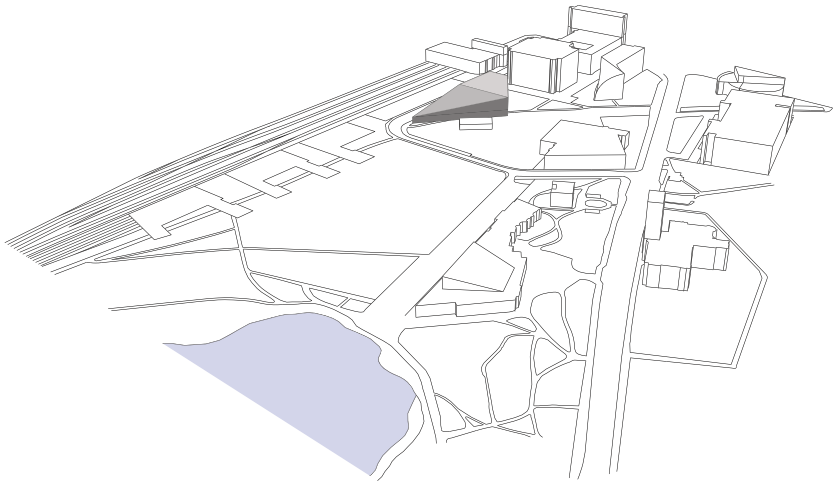
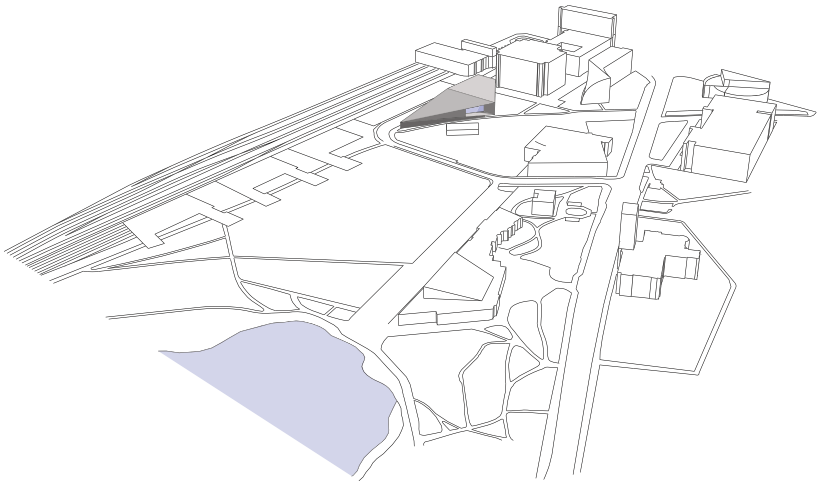






MICROCLIMATE
(as design criteria)

It is important to systematically treat the distinct scales and differences in altitude from the surface on which the climatic processes take place in microclimate. It is defined as follows (*Hensel et al*, 2006: 66):

"Microclimate is the climate near the ground, that is, the climate in which plants and animals live. It differs from the macroclimate, which prevails above the first few meters over the ground, primarily in the rate at which changes occur with elevation and with time. Whether the surface is bare or vegetated, the greatest diurnal range in temperature experienced at any level occurs there. Temperature changes drastically in the first few tens of millimeters from the surface into the soil or into the air. Changes in humidity with elevation are greatest near the surface. Wind speed decreases markedly as the surface is approached and its momentum is transferred to it."

Microclimate could be seen as architectural tool that can be used to improve prevailing conditions surrounding the building. Microclimate is commonly used as parametric optimization in form-finding. Effects on the microclimate conditions are mainly determined by the massing of the building and are thus attached to the early stage of building design. In addition, some adjustments to microclimate are possible to achieve with material selections and facade structures.

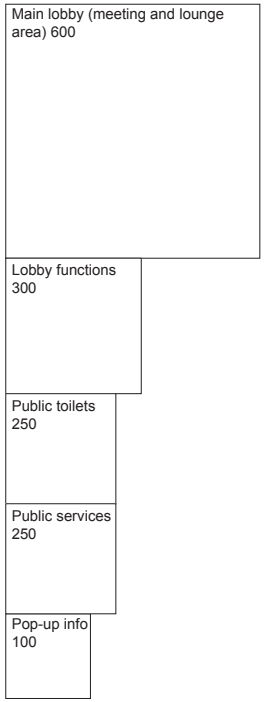
The image sequence of steps of building transformation is presented on the adjacent page. The steps of the sequence are mainly based on microclimatical adaptation.

Mood

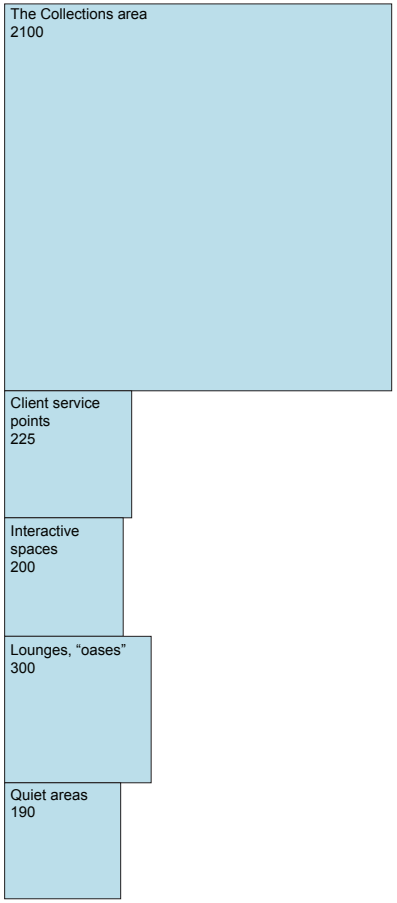
Site conditions | Building optimization | Technology | Energy production/recycling

PUBLIC SERVICE SPACES 8205

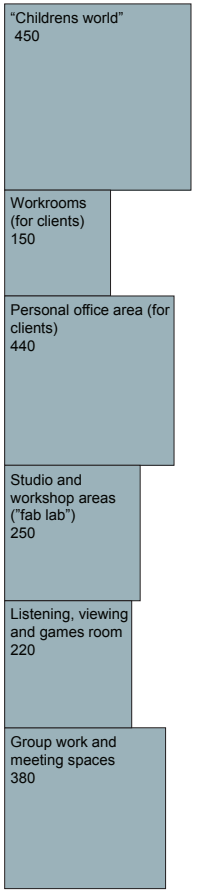
MAIN LOBBY AND CENTRAL SERVICE SPACES 1500



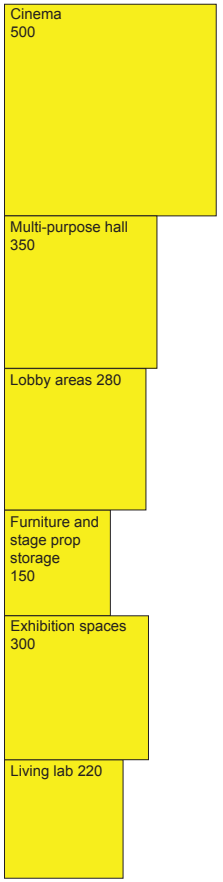
COLLECTION AREA AND LINKED SPACES 3015



LEARNING AND DOING 1890

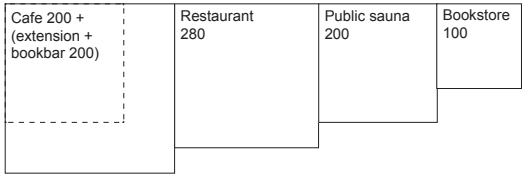


EVENT SPACES1800

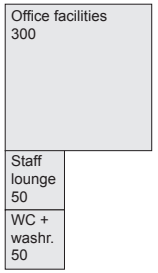


SERVICE SPACES 2510

SPACES FOR EXTERNAL SERVICES 980

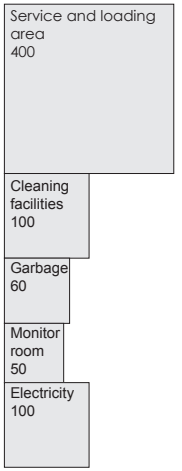


STAFF FACILITIES 400



LOGISTICS AND MATERIAL HANDLING 420

SERVICE SPACES 710



+Technical spaces about 7% of gross floor area

SPATIALITY

In the process of reformulating architectural concepts lies the very nature of architecture and its essential element: space. Theory and praxis may be dialectic to one another, but in space and spatiality the translation of concept is created (*Tschumi*, 1996: 48). The practical side of the concept is usually laid out as the program of building.

PROGRAM / FUNCTIONS

The program defines the project as an overlap between form and program. In the Helsinki Central Library competition, the room program is defined in very detail, and it is mainly focused on composition and arrangement of the program. According to it the room program area expected is in total about 10 000 m2.

Public building consists of mixture of spaces accessible to public and private spaces. In current mediatheque library space mainly consists of flexible public areas. The private spaces included are usually staff facilities and service areas. There are also areas that have limited access for public, such as, meeting rooms, workshops and other facilities. These areas that work as transition areas between public and private can be called as semi-public or semi-private areas.

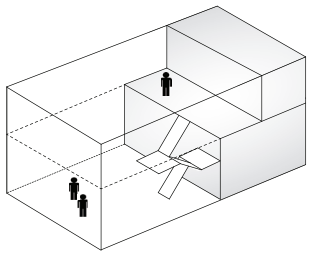
The program of Helsinki Central Library defined in the competition program is visualized in the adjacent diagram. The diagram is adapted to the current design presented in this thesis. The spaces only allowed for people working in the library are depicted in gray colour.

Building function
City Structures
Connections (in city)
Technology
Building optimization
Interior structures

STEPS
spatial entity with scenery
steps

+

SPIRAL
entrance area with 3 en-
trance points



VOLUME1
+
VOLUME 2
▷
TOTAL VOLUME

SPATIAL QUALITY (negative/positive space)

As we look at the space around, we tend to organize our visual field into two opposing groups: positive elements that we perceive as figures, and negative elements that provide a background for the figures. While at first these two concepts — '*positive and negative space*' — seem opposites, in fact each depends upon the other (*MyHumanitiesStudio*, www-page). Positive elements that hold our attention could not exist without a contrasting background.

Architectural structures are perceived (and designed) to form an inseparable unity of form and space — of positive and negative elements. Buildings and structures are typically perceived as positive space, while the sky and ground around the structures are interpreted as negative space.

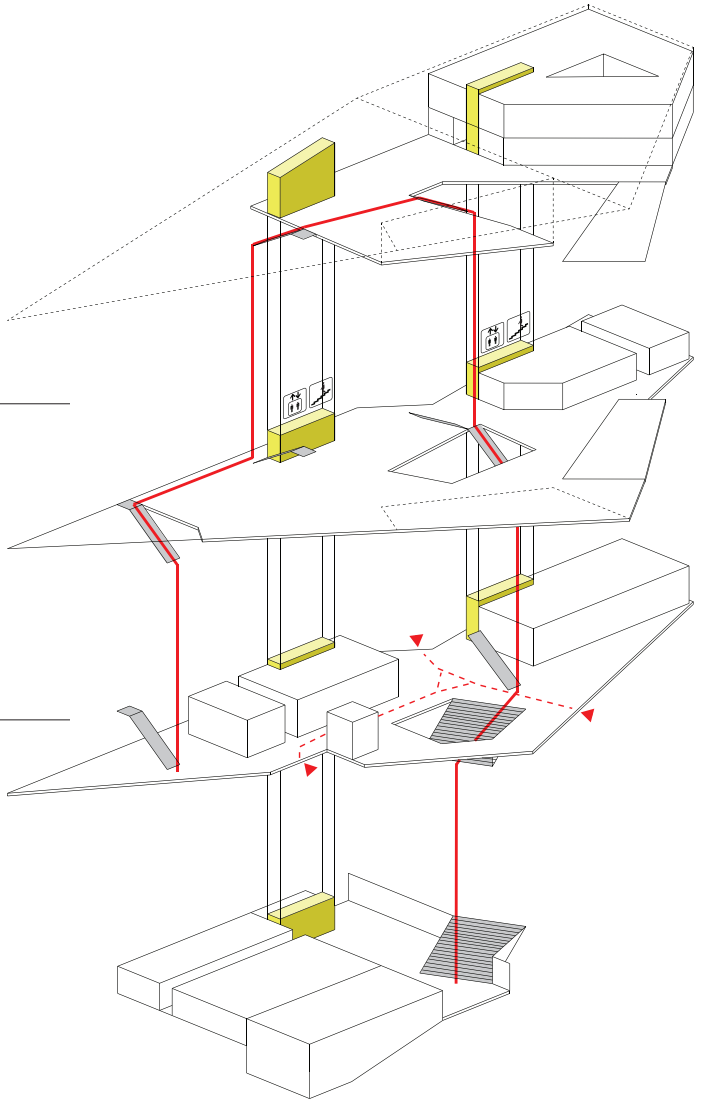
Looking into the building's interior space, which contributes to the spatiality of building, it reflects the functional concept and vice versa. The functional concept is determined by the relationship of functionality and spaces defined in the program, and their inter-relationships determination. The interior of large public building is defined by the spatiality of the nature of open space, i.e. positive space.

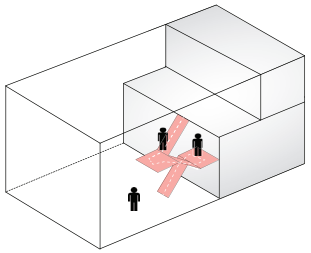
In the studies of Rem Koolhaas, the Very Big Library -project is interpreted as a solid block of information (i.e., positive space), a repository of all forms of memory - books, laser discs, microfiche, computers and databases.
In this block, the major public are defined as *absences of building*, voids carved out of the information solid. Floating in memory, they are multiple embryos, each with its own technological placenta. (*Koolhaas*, 1992: 616)

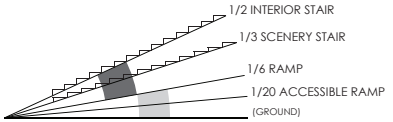
In this context, spatiality has been seen as space connecting through levels of floor-to-floor slab height. In other words, levels are connected with open space spatial connections within envelope and slab structure. In the enclosed diagram, spatiality of positive space has been expressed with combination of spatial elements.

'Scenery route' creating access around library

Lobby with with 3 entrance points







CONNECTIONS

The space is genuinely experienced by being in it, through physical presence. Since the simplest and the most compelling means of ascertaining our bodily presence in space is *movement*, those elements of vision that contain motion, changes of perspective and focal point, are best suited to conveying an impression of space. But seeing itself is not a sense that defines being-in-something but rather a sense that establishes difference and creates distance. (*Ursprung,* 2002: 402)

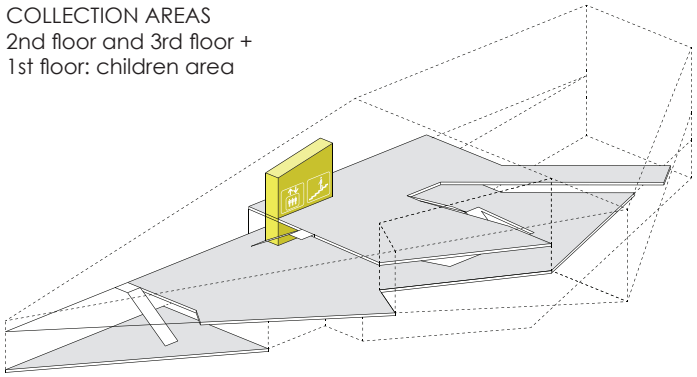
Connections through space forms the actual usage and function, as well as, the spatial quality of the building can be obtained through spatial sequences of a building (*Tschumi,* 1996: 154). The spatial sequence tends to rely on the use of devices, or rules of transformation, such as compression, rotation, insertion, and transference. These devices can be applied to the transformation of spaces as well as programs.

In the diagram on the adjacent page, presents the main route through the collections area and public spaces of the library. The presented connection is accompanied by two main lift connections. Library can be accessed by public from tree points from the ground level. When entered to building, these access points form a different view to the main lobby and the surrounding spaces.

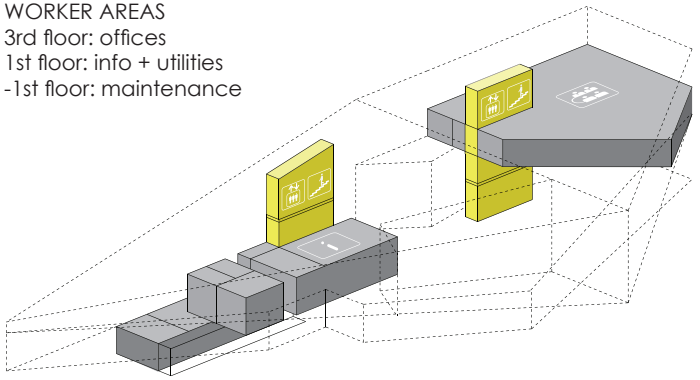
Technology (electricity)

Facade structures Load bearing structures (lifts) Interior structures

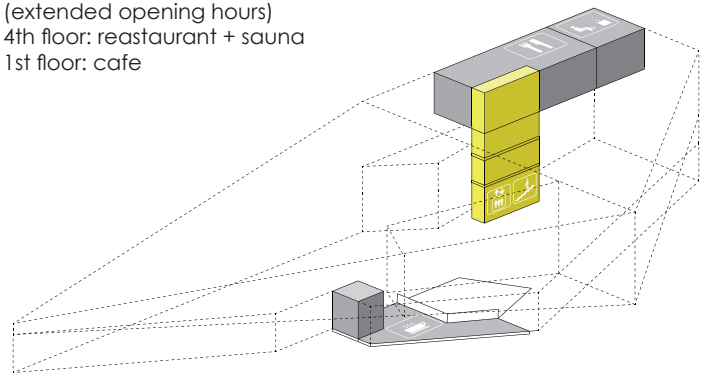
COLLECTION AREAS
2nd floor and 3rd floor +
1st floor: children area



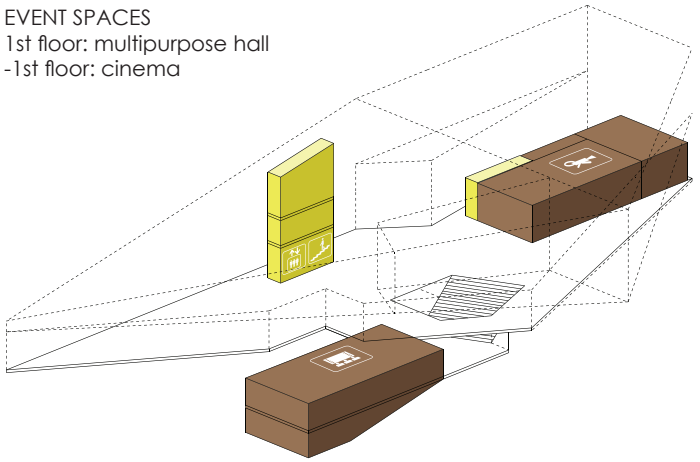
WORKER AREAS
3rd floor: offices
1st floor: info + utilities
-1st floor: maintenance

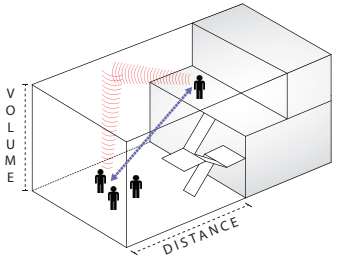


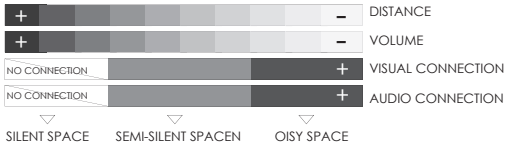
INDEPENDENT AREAS
(extended opening hours)
4th floor: reastaurant + sauna
1st floor: cafe



EVENT SPACES
1st floor: multipurpose hall
-1st floor: cinema







PRIVACY

The privacy or the level of calmness often defines the functional application of a place in public building. With public buildings as libraries large amount of space is often defined as generic plan that allows adaptation. The amount of privacy of space is determined by several factors, among them, the most fundamental are defined by the properties of space and materials.

Separated or enclosed areas are depicted by the adjacent diagrams. These diagrams show different usage scenarios. The principal usage of the library is collection areas, event spaces (cinema and multi-purpose stage), time extended areas (cafe, restaurant and sauna department), and workers areas (not accessible by the public).

Factor of privacy are defined by a diagram (far corner), which divides the main factors of space characteristics into two categories, distance in space from sound source, and the volume (and materials) of the space. The experience of space is also affected by personally experienced elements of visual and audio visual connection between the distraction and subject.

Interior structures (walls, ceiling, furniture)

MOOD OF SPACE

A mood contributes to sensing where we are. By the feeling our presence we feel the ambience of space in which we are present. We sense what kind of space surrounds us. The built environment has significant influence on our mood.

In the drawing, by Ernst Mach (The Field of Vision, 1886), the visual field is in focus and detail from the center to the periphery where it suddenly fades into white. The drawing of Mach is not a true representation of perceptual experience, which, in fact, is not continuous, consistent and detailed. Vice versa is discontinuous, fragmented and poorly detailed. The peripheral fade-out gives tunnel-like feel to the whole visual field, which funnels towards centre with a slight feel of vertigo. (*Spuybroek*, 2004: 323)

Colours, sounds, temperatures, pressures, spaces, times, and so forth, are connected with one another in manifold ways; and with them are associated dispositions of mind, feelings, and volitions. Out of this fabric, that which is relatively more fixed and permanent stands prominently forth, engraves itself on the memory, and expresses itself in language. Certain complexes of colours, sounds, pressures, and so forth, are functionally connected in time and space. (*Mach*, 1957)

City structure Microclimate

Technology (ventilation)

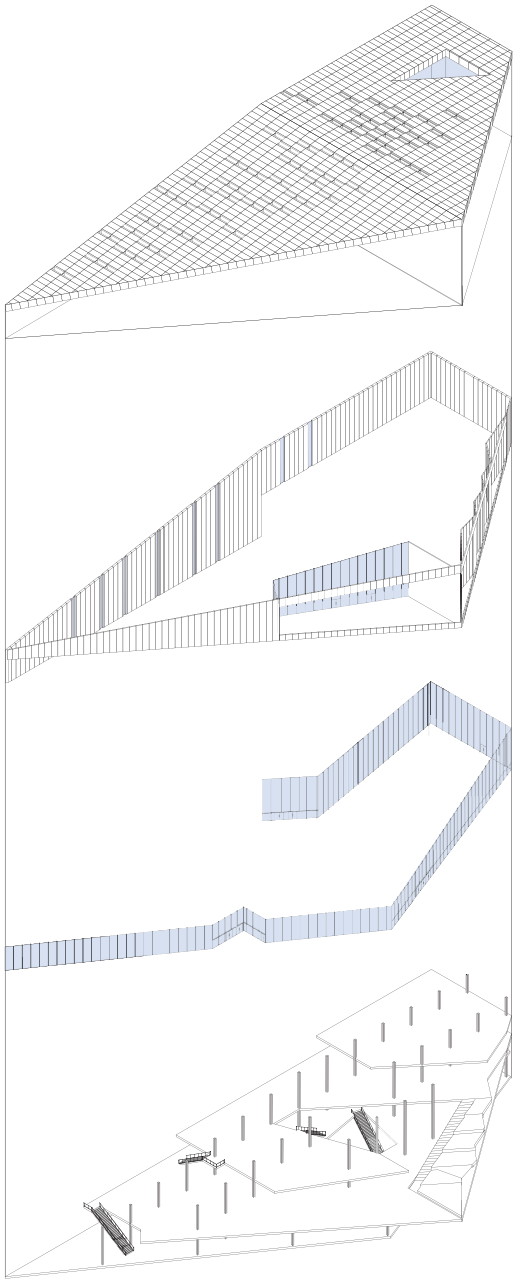
Interior structures

Metal sheet roof structure
with openings

Metal sheet facade with
with varying perforations
+
Public balcony

Street level glass facade

Load bearing beam grid
+
Slab structure



STRUCTURE

LOAD BEARING STRUCTURES

There is not possible the architecture to be without structures that ensure sufficient stability and solidity of design. The most obvious and basic function of a structure is its capacity to keep something above the ground by bearing loads, and the practical use gained from the capacity is to floors, walls, and roofs in an elevated position, thereby establishing inhabitable spaces (*Sandaker et al*, 2011: 02).

In many cases in architecture, however, structures are not solely associated with such load-bearing functions. To understand structures in a wide sense as being part of architectural context also means seeing their forms as space-defining elements, or as devices.

FACADE STRUCTURES

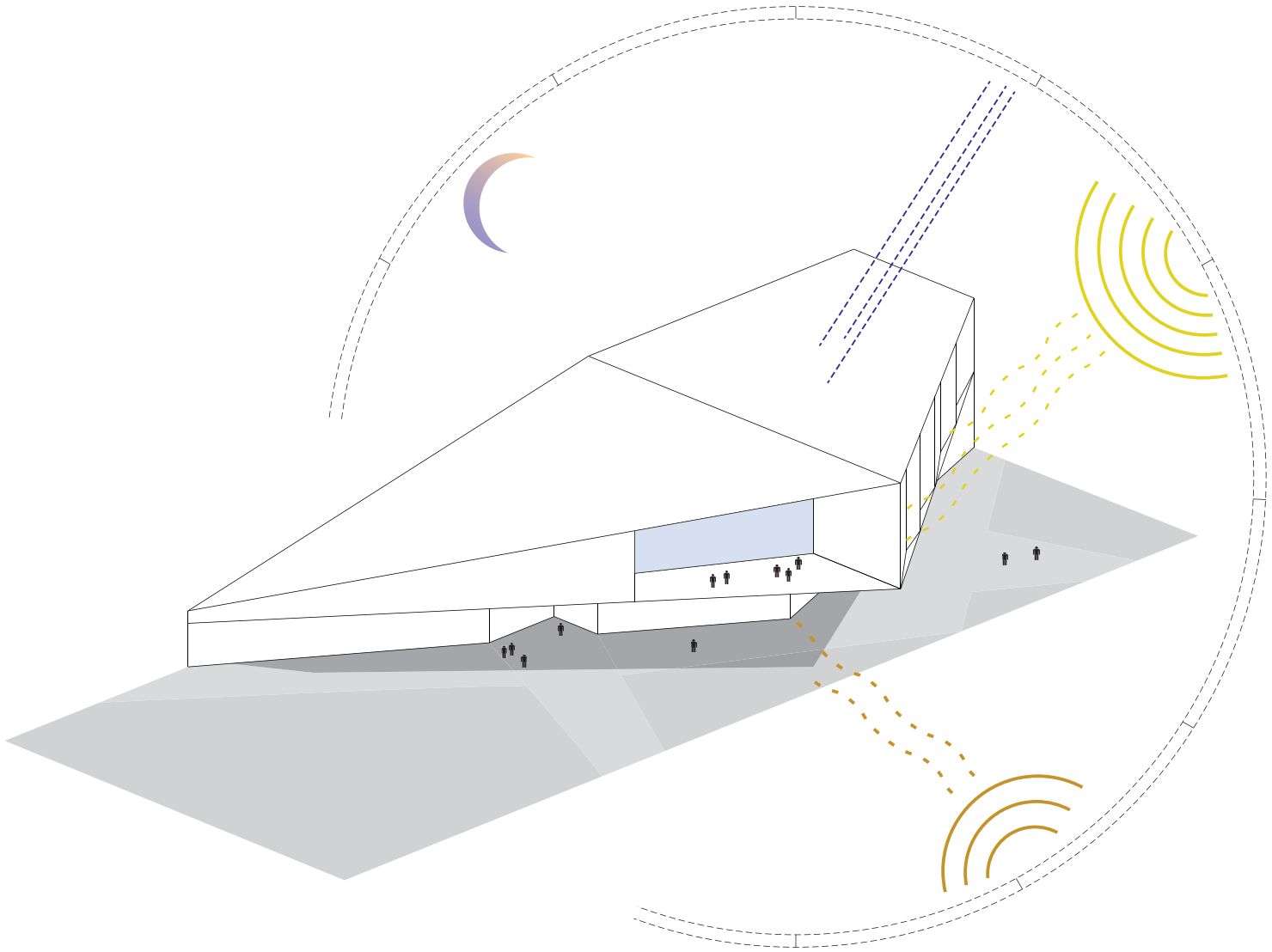
The notion of a dual function of structure, can range from those conceived of as pure force systems that follow a logic of maximum strength for a minimum materials (i.e., structural efficiency), to those designed to act iconographic visual images. That kind of visual images is usually associated with facade structures or on the other hand interior structures.

INTERIOR STRUCTURES

As interior structures are considered structures and materials that cover, divide and articulate the inside space of building. Interior materials have fundamental role for defining the mood of the space.

The structure of design is depicted as layered diagrams. The layers from bottom to top are: load bearing structures (columns, slabs and ramps), street level glass facade, partly perforated metal-sheet facade, and roof structure.

Collections Building form
Functions Spatiality Connections Accessibility Privacy
Site conditions City structure Building optimization Materials Technology



SUSTAINABILITY

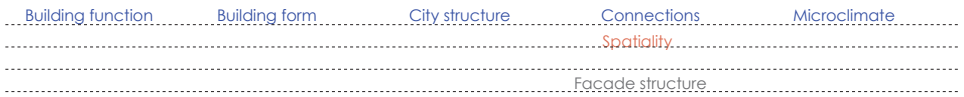
Environmental sustainability, as an issue of far reaching global significance, has in recent years created world-wide recognition. Building and infrastructure construction is among the most critical sectors in terms of sustainability. By current figures of recent United Nations reports, construction and urban environment are responsible for the consumption of a significant proportion of our natural resources for one third of energy consumption, for 30 to 40 per cent of emissions, and for as much as 50 to 60 per cent of waste production (*Feireiss,* 2009:13).

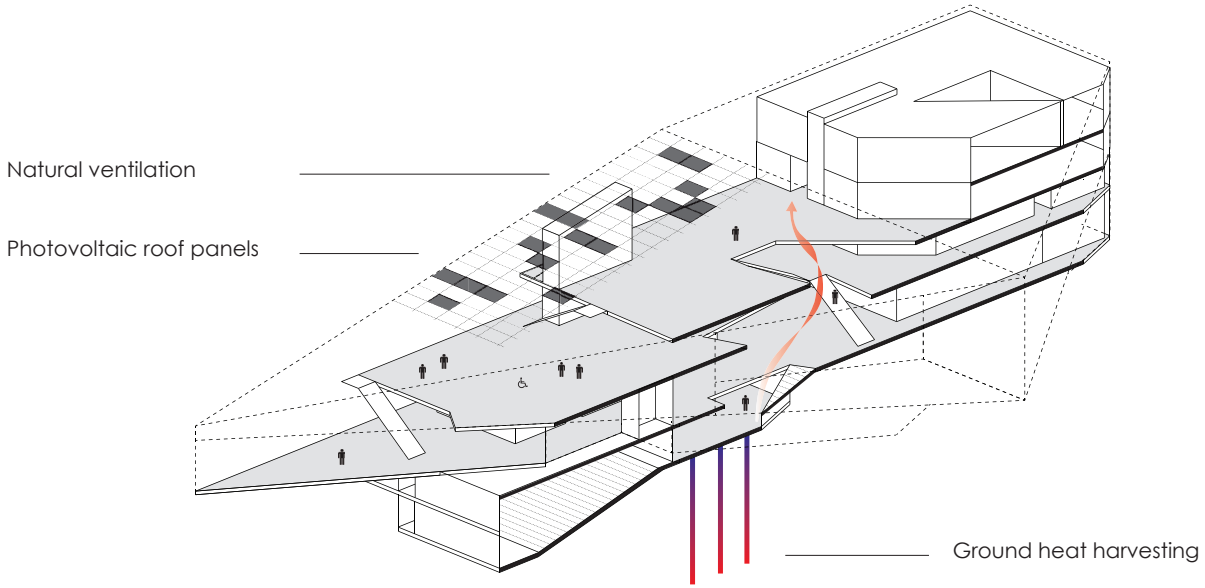
The objective for the Helsinki Central Library competition is that the building will be a nearly zeroenergy building. The energy performance is measured according to the total annual primary energy use of the building, defined as the E-value, which indicates the annual delivered energy use of a building. (*Competition program*, 61)

BUILDING OPTIMIZATION/ SITE CONDITIONS

For obtaining the zero-level energy usage, building must be optimized as such. Building optimization starts with the static elements of a building: natural light impact, orientation of the building, open and closed facade strategies and related program orientation. The aspects of heat and daylight intake are seen as key parameters when formulating facade systems, leading the way to discoveries in geometries and material use. All the previously mentioned static elements relates to prevailing conditions of the site.

The enclosed diagram visualizes the outdoor conditions of the designed building around the day. The wall facing midday sun ranging in angles and is covered with perforated steel panels. The balcony around the corner is receiving the evening sun. Moreover, the entrance is covered by the overhang of the building.




Natural ventilation
Photovoltaic roof panels
Ground heat harvesting

MATERIALS

Materials of building design are one of the most fundamental elements in building design, especially from sustainability point of view. Ecologically thinking the material efficiency is affected by material manufacturing process, locality, and material lifecycle. Also recycling of materials is important part when targeting to material efficiency. In the competition program, the demand for the choice of materials and structural solutions, is to strive for material efficiency and a small environmental impact. The objective is to avoid structural solutions that have unfavourable environmental impacts without, however, compromising on the quality of the cityscape and architecture (*Competition program*, 63).

TECHNOLOGY/ ENERGY PRODUCTION

In addition, engineering and technology is integral part of future-oriented building regulation systems, such as carbon emission controls, heating and lighting systems, cooling and ventilation, as well as the use of renewable energy sources, set a target for lowering the carbon footprint (*UN-studio*, www-page). A strategic effort can yield more affordable buildings by investing in the right components to increase building quality. Together with the individual project based parameters and constraints further innovation and progress is made possible.

The interior situation of the building is presented in this enclosed diagram. The energy production of the building is obtained by photovoltaic panels on the roof and by harvesting ground heat. Ventilation in the building is handled by natural ventilation.

Building form Connections

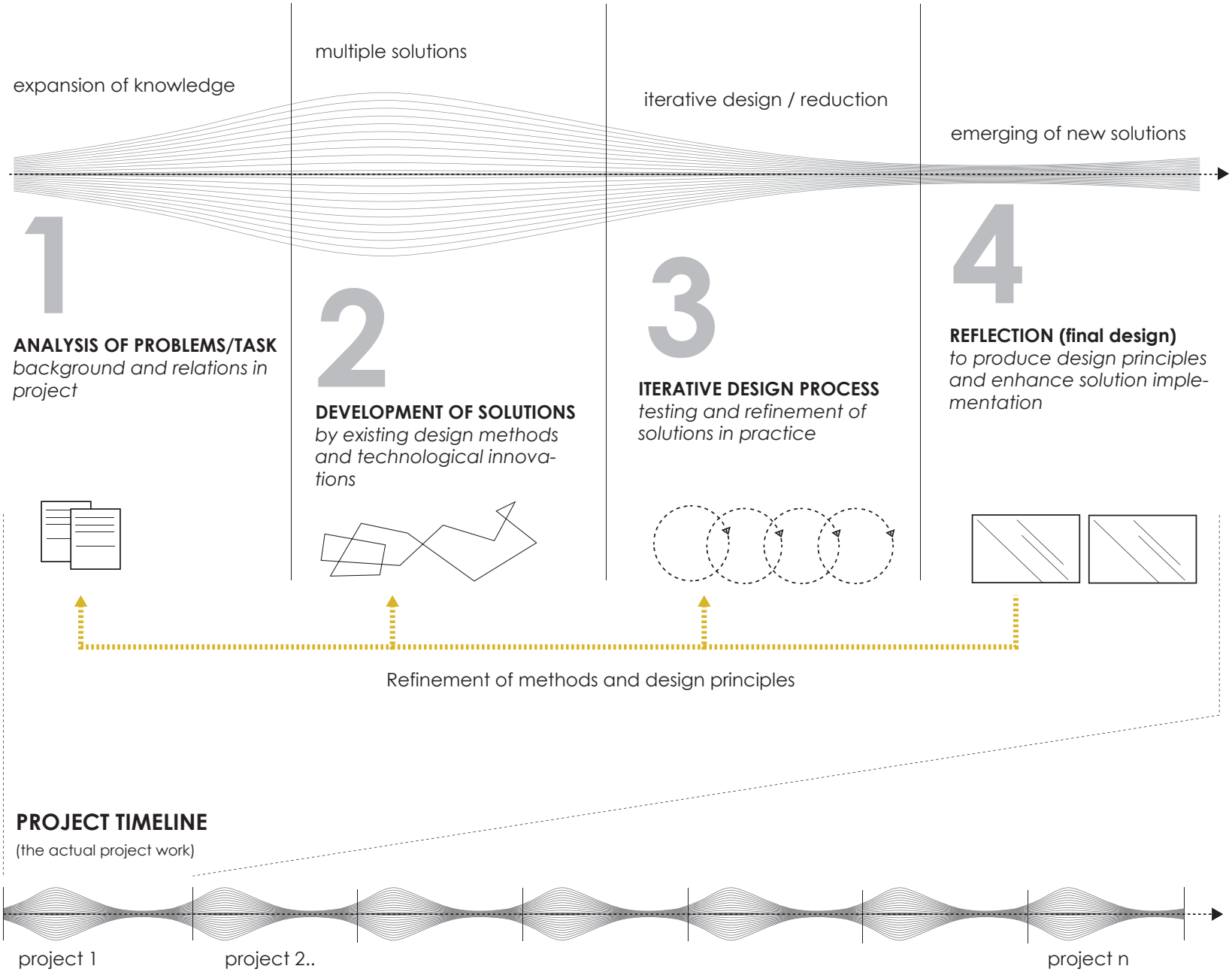
Functions Connections Mood

Structure

CONCLUSIONS

REFLECTIONS OF FINAL DESIGN

4


expansion of knowledge
multiple solutions
iterative design / reduction
emerging of new solutions
1
ANALYSIS OF PROBLEMS/TASK
background and relations in project
2
DEVELOPMENT OF SOLUTIONS
by existing design methods and technological innovations
3
ITERATIVE DESIGN PROCESS
testing and refinement of solutions in practice
4
REFLECTION (final design)
to produce design principles and enhance solution implementation
Refinement of methods and design principles
PROJECT TIMELINE
(the actual project work)
project 1
project 2..
project n

FROM DESIGN PROCESS TO TEMPLATES

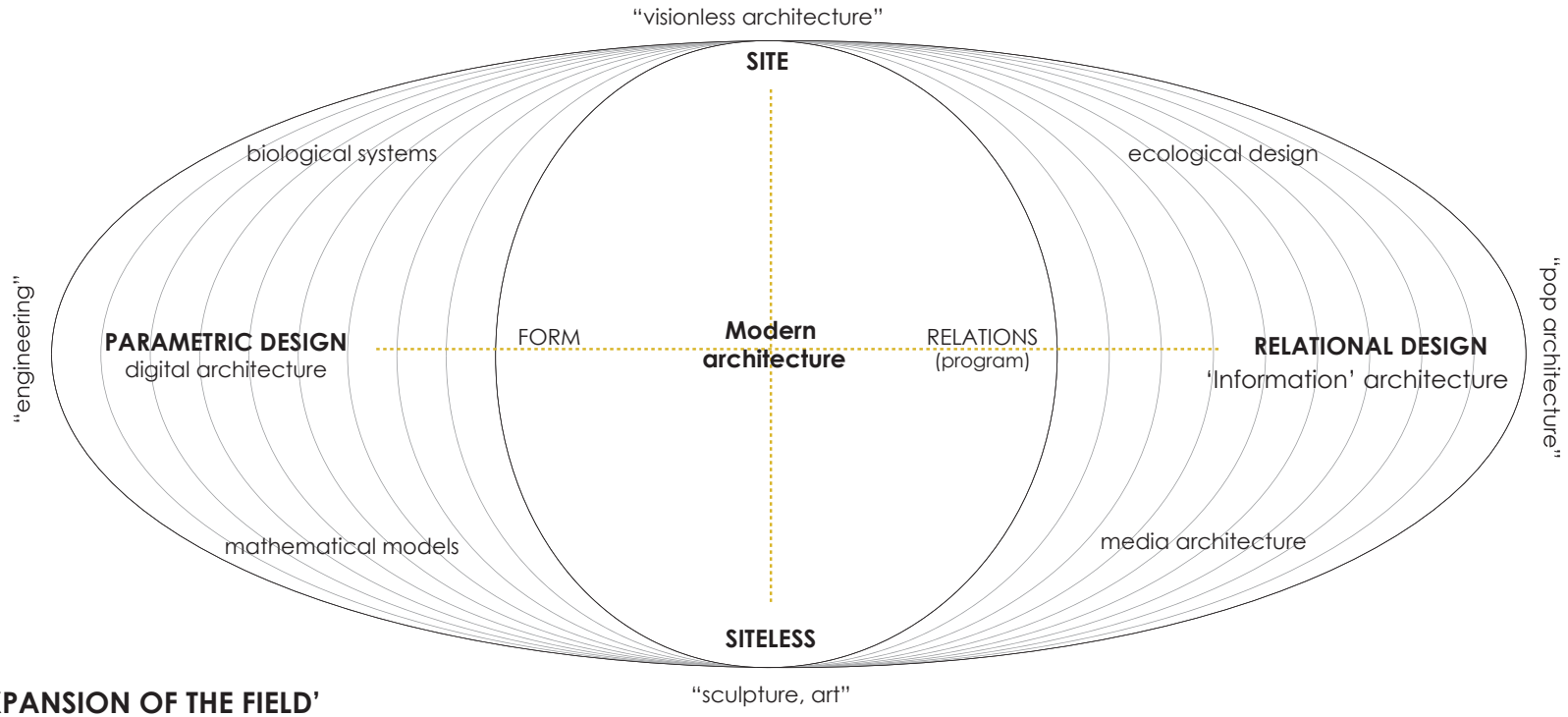
This Thesis work is associated with the 'The Heart of the Metropolis — Helsinki Central Library Open International Architectural Competition', and more specifically on the competition task. However, the project presented here is not a competition entry. In the Helsinki Central Library Competition took part 535 proposals from which six were elected to second phase of competition, and finally as the winner was chosen proposal '*Käännös*' by ALA architects. The entries chosen to second phase are presented in the attachment C.

Moreover, the thesis work mainly focuses on the design process and new approaches in the architecture. How architects can approach architecture by no longer viewing design in terms of individual projects or buildings, and instead seeing it in relation to templates (models) that can be transferred from one project another. Architects can generate their own templates, or '*design models*', that summarize a set of principles to help them to select and implement the right parameters and develop the vision even further.

PROJECT TIMELINE

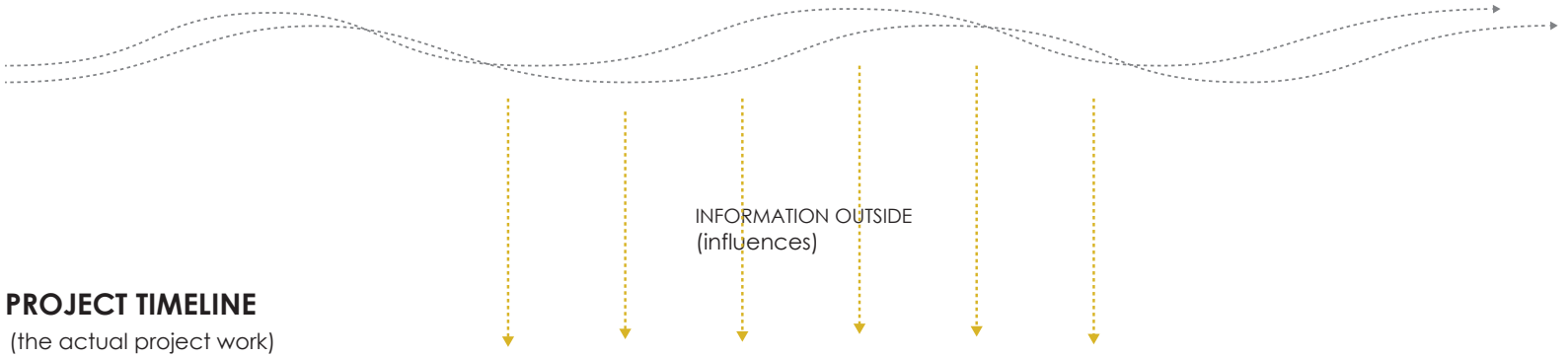
The project timeline presents a typical timeline of design practice. As a result of project, there is data produced that can be stored and refined for the future use. Outcome of this is called here as '*accumulation of data*'. This accumulation can be thought as '*personal database or toolset*', which can to be adapted in the future projects. The personal database includes: methods, learned information, and information about styles and visual information. This information is also affected by influences outside of own project work by studies, works and theories by other operator in the field (and outside of the field). By the information updates from outside and inside the personal toolsets should be rearranged for better correlation of the challenges in current practice.

In the diagram project timeline of individual project is presented as a part longer continuum of projects. Each of the phases in the design process form a connected iterative process that allows return to each of them in any stage of the project. The line graph presented in the diagram represents 'the amount of design solutions' in the process. During background analysis the amount of design solutions is increasing and during design process the amount is reduced. In the late stages of project realization the amount of studied solutions increases again, which is due to better knowledge of project.



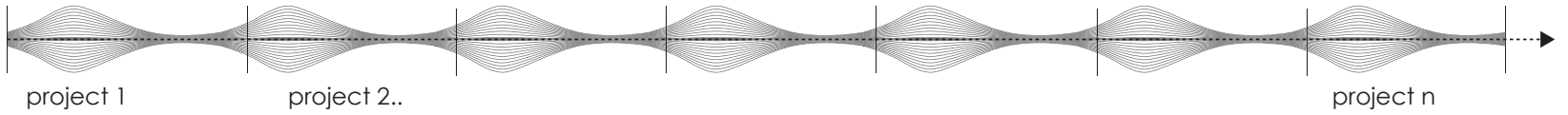
'EXPANSION OF THE FIELD'

(design trends & styles
technology development)



PROJECT TIMELINE

(the actual project work)



EXPANSION OF THE FIELD

As the practice expands most of the architects find need for expanding the field by influences from other architects or totally from other areas of life. For example, Alvar Aalto spoke of receiving 'impulses' rather than being passively influenced; questioning, playing with, and evolving concepts through the visceral spark and nuances rather than trusting in any received theory (*Charrington*, 2011: 74).

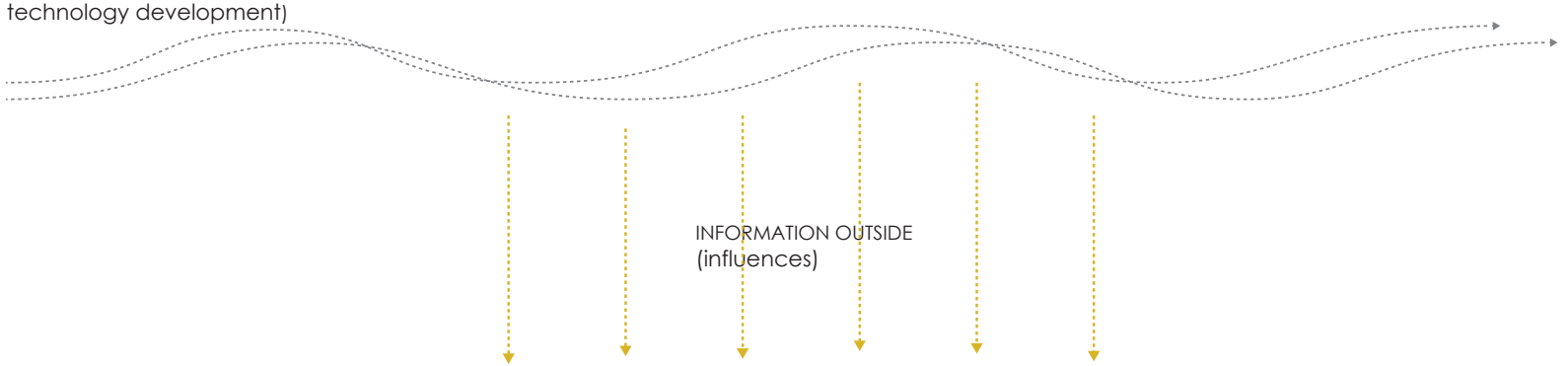
The expansion of knowledge is enabled by external influences and information expanding the knowledge. The traditional modernist architecture of 1900's is depicted in the diagram as the basis of architectural design, which mainly focusses on the relation between form and program, and site relation. The projective architecture expands the theoretical framework of modernist architecture by two apparent major branches of architectural design: parametric design and relational design.

The new rise of parametric design has been enabled by technical improvements (i.e., software and hardware). Despite of that the material system studies have been part of design practice for decades. The relational design expands the practice by creating dynamic relationships between the design and it's the audience. It is more concerned with performance or use, not as the natural result of some intended functionality but rather in the realm of behavior and uncontrollable sequences.

Expansion of traditional modernist architecture is depicted in the oval diagram. The traditional modern architecture mainly focuses on the relation between form and program, and is focussed on the site depending on the approach to design. Many new companies in the business combine several approaches where one approach is more dominant than the others. With extreme approaches falling close to the edge of the diagram one-sided approach is more likely. The possible outcomes of one-sided approaches are presented in the apostrophes.

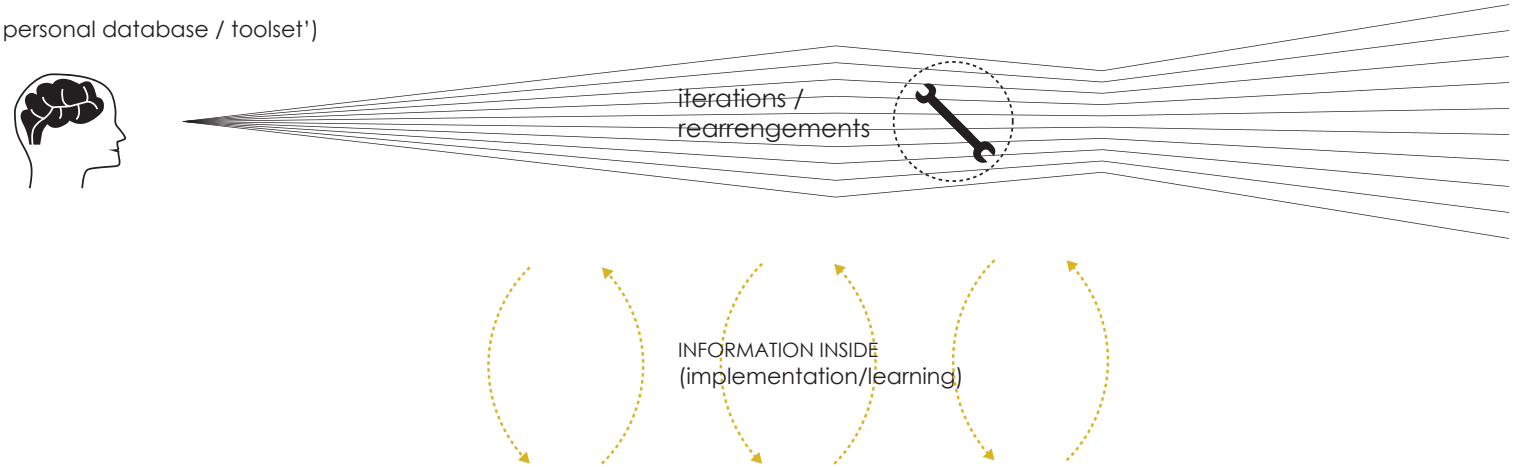
‘EXPANSION OF THE FIELD’

(design trends & styles
technology development)



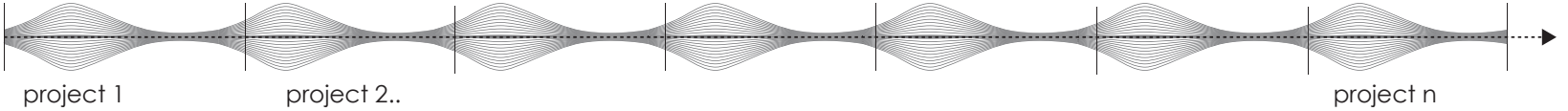
ACCUMULATION OF DATA

(’personal database / toolset’)



PROJECT TIMELINE

(the actual project work)



Architecture is both the process and product of planning, designing, and construction. In relation to buildings, architecture is dealing with the planning, designing and constructing form, space and ambience that reflect functional, technical, social, environmental, and aesthetic considerations.

NON-LINEAR METHOD: RESEARCH AS DESIGN

For the creative architectural approach the focus is rather on design than building. Design is a process about establishing and documenting a designer's intentionality. It is limited by imagination, skill and knowledge of the participants. As tasks in design continue to get increasingly complex and varied, the study of task and documentation becomes more prominent. The design becomes more research-like. It investigates a topic in order to allow otherwise unforeseen discovery. In the design process that is iterative and focused on the documentation of the design process can lead to multiple solutions. This approach can be called as '*speculative research*' or '*research as design*'.

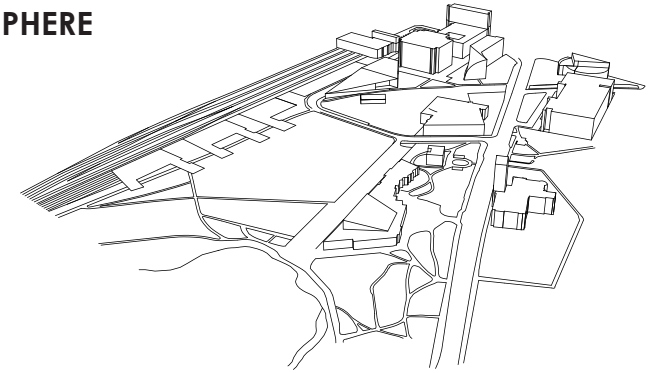
The elementary principle of this thesis work is presented design methods (relational design, GIGA-mapping, etc.). By broadening the approach, it rather escalates the essence of architecture as building design rather than falls back to critical practice of modernist architecture. The research as part of design is not limited to architecture as an adaptation platform. It has also close resemblance to previously presented projective architecture as a prevailing design philosophy. By reseach-like design method plenty of data is produced.

ACCUMULATION OF DATA

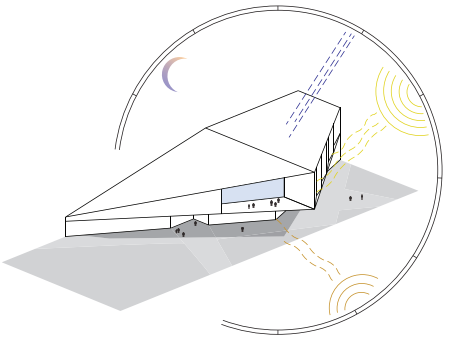
When learning from other disciplines, for example, Ferran Adria world-famous chef's approach to his work has always been driven by '*the accumulation of data*', which he has used rigorously and strategically in order to build a database that underpins his work. This theoretical framework is broken into five areas: organization and philosophy, products (concepts), technology, elaborations, and styles and characteristics (*Williams*, 2012: 109).

The freshness in design is maintained and enhanced by accumulation of information. It is not that most architects seem to progressively narrow their range or alternatively - sensing lack of attention - or strike out in all sorts of thoughtless ways, but this recession has been taken place in many occasions. It will only lead into situation where the power of design and eventually degradation in produced architecture prevails.

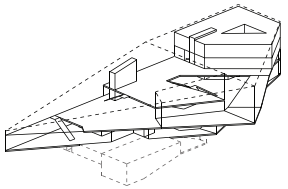
SITE/ATHMOSPHERE
(conditions in site)

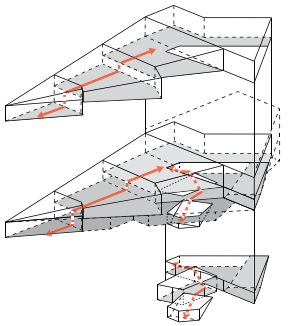


SUSTAINABILITY
(project conditions)

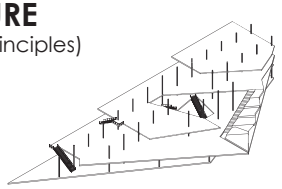


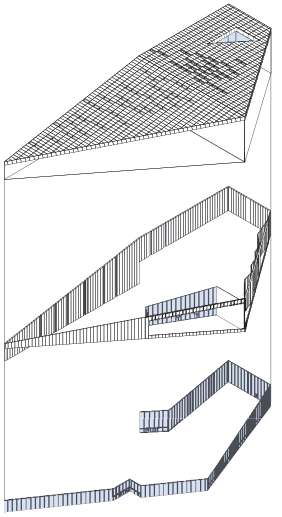
SPACE/FORM
(spatiality model)





STRUCTURE
(structure principles)





FURTHER QUESTIONS AND STUDIES

In architecture, concepts can either precede or follow projects or buildings. In other words, a theoretical concept may be either applied to a project or derived from it (*Tschumi,* 1996: 19). Architecture's inherent confrontation of space and use means that architecture is constantly unstable, constantly on the verge of the change. The complex cultural, social, and philosophical demands developed over centuries have made architecture a form of knowledge in and of itself. As practice and as theory, architecture must import and export.

As for the summary of the project the main elements of inspection in this Thesis are presented in the adjacent page. For the future, more study and processing is needed for working with the approaches to accumulated project data. The project aimed at getting insight of the relations and linked structure of building design. It forms a system that has a causal relationship between the prevailing design goals (practice) and designer's insight (i.e. theories).

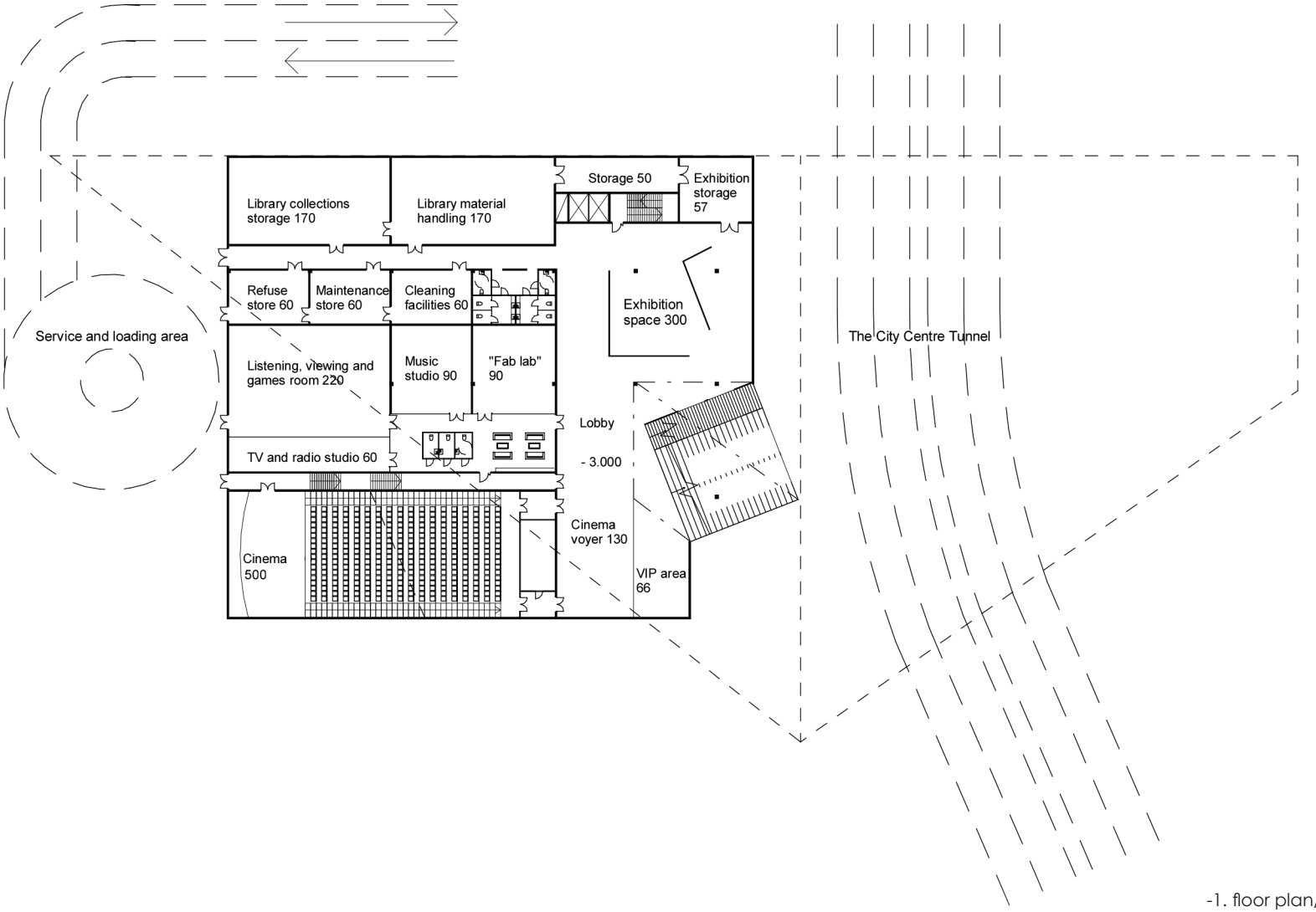
The dual practice of architecture consisting of pragmatism and architectural thinking is defined by Rem Koolhaas, as the following:

"In OMA we divide the entire field of architecture into two parts: one is actual building, mud, the huge effort of realizing project; the other is virtual - everyhting related to concepts and 'pure' architectural thinking. I'd say that my profession ends where architectural thinking ends - architectural thinking in terms of thinking about programs and organizational structure. These abstractions play a role in many other disciplines, and those disciplines are now defining their 'architectures' as well. There is a kind of multiplication of architectural activities. I don't feel that I am becoming less of an architect, but more." - REM KOOLHAAS (*Cortes,* 2007: 5)

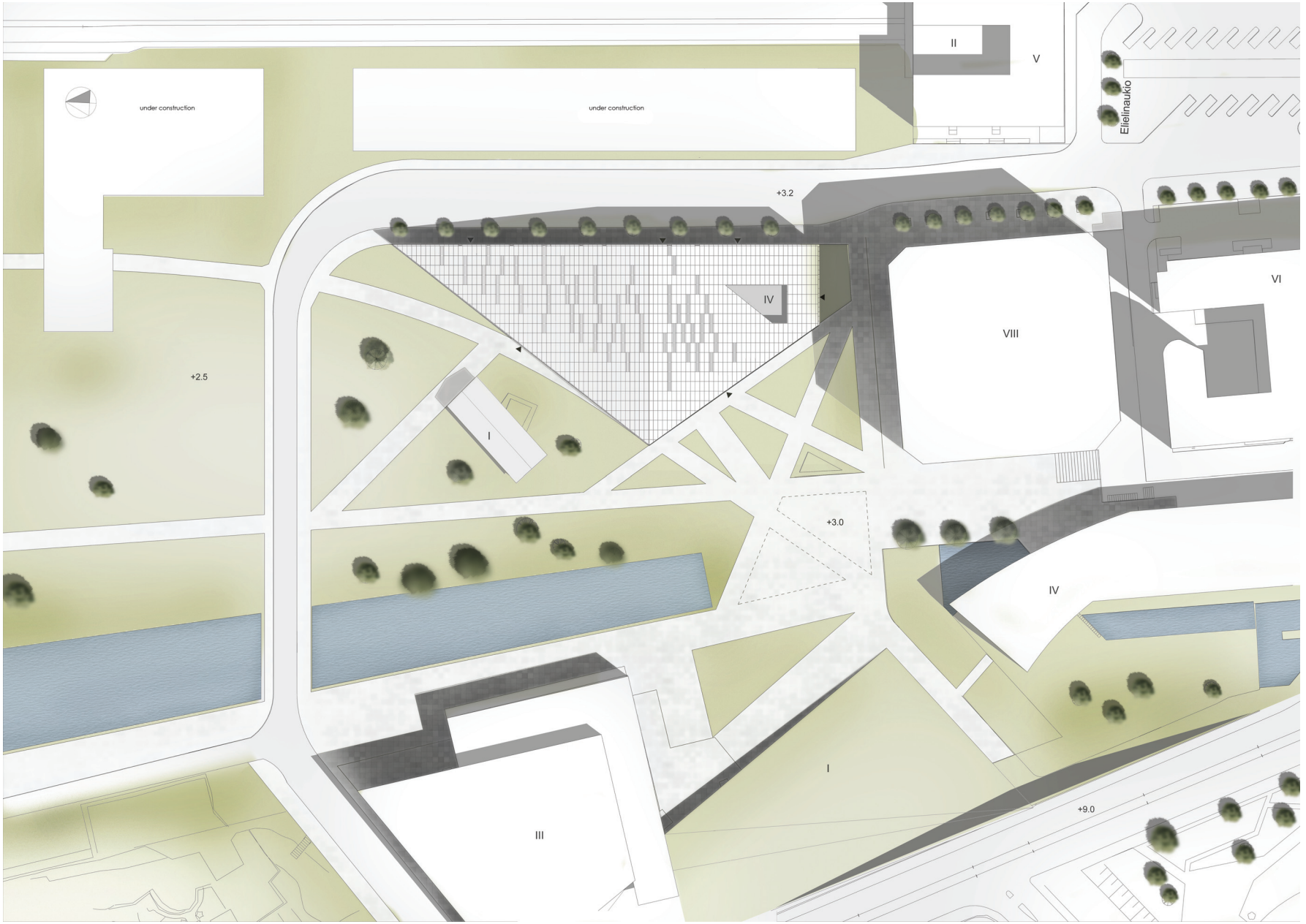
ATTACHMENTS

A

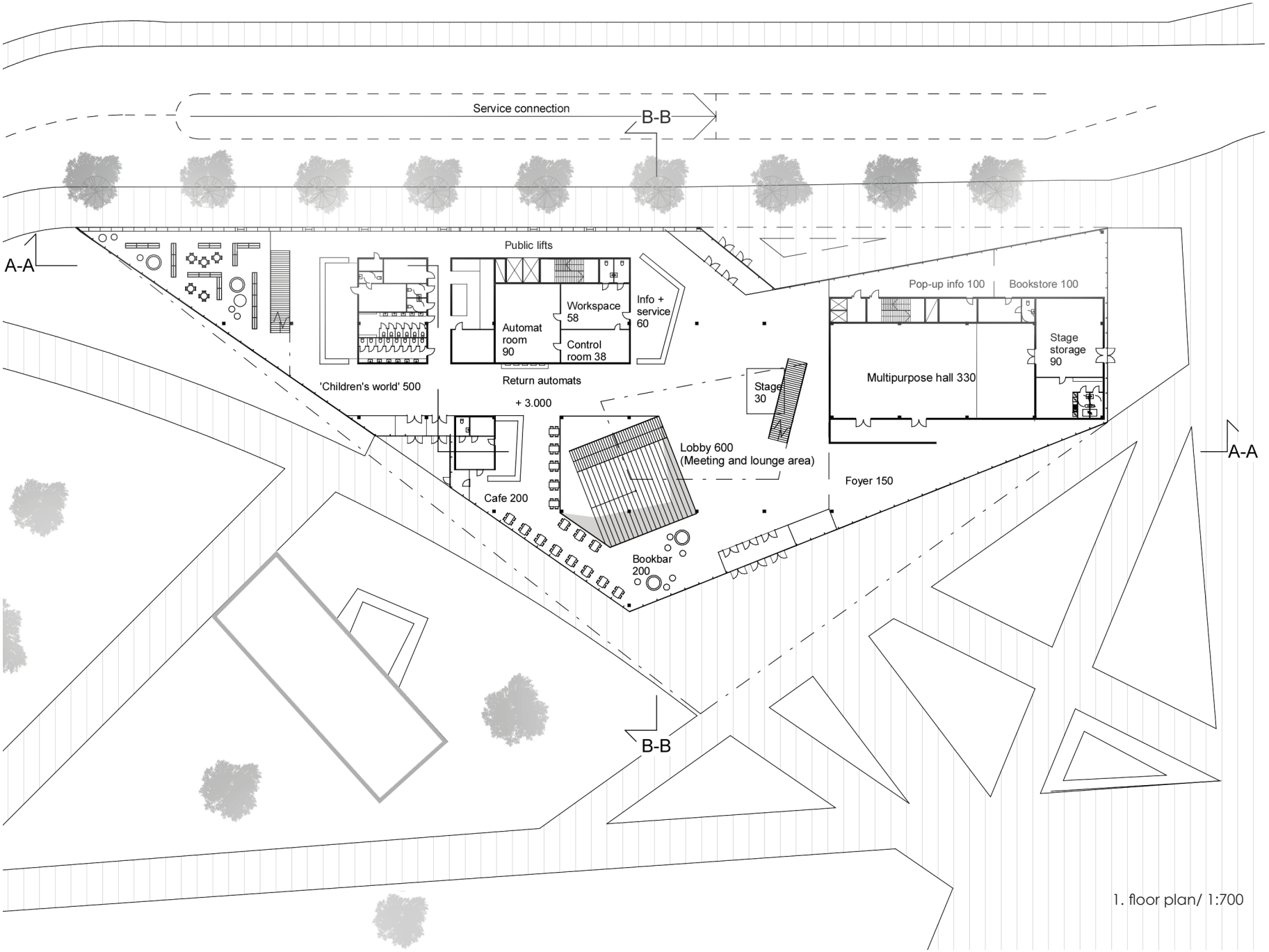
ATTACHMENT A
THE PROJECT IMAGES



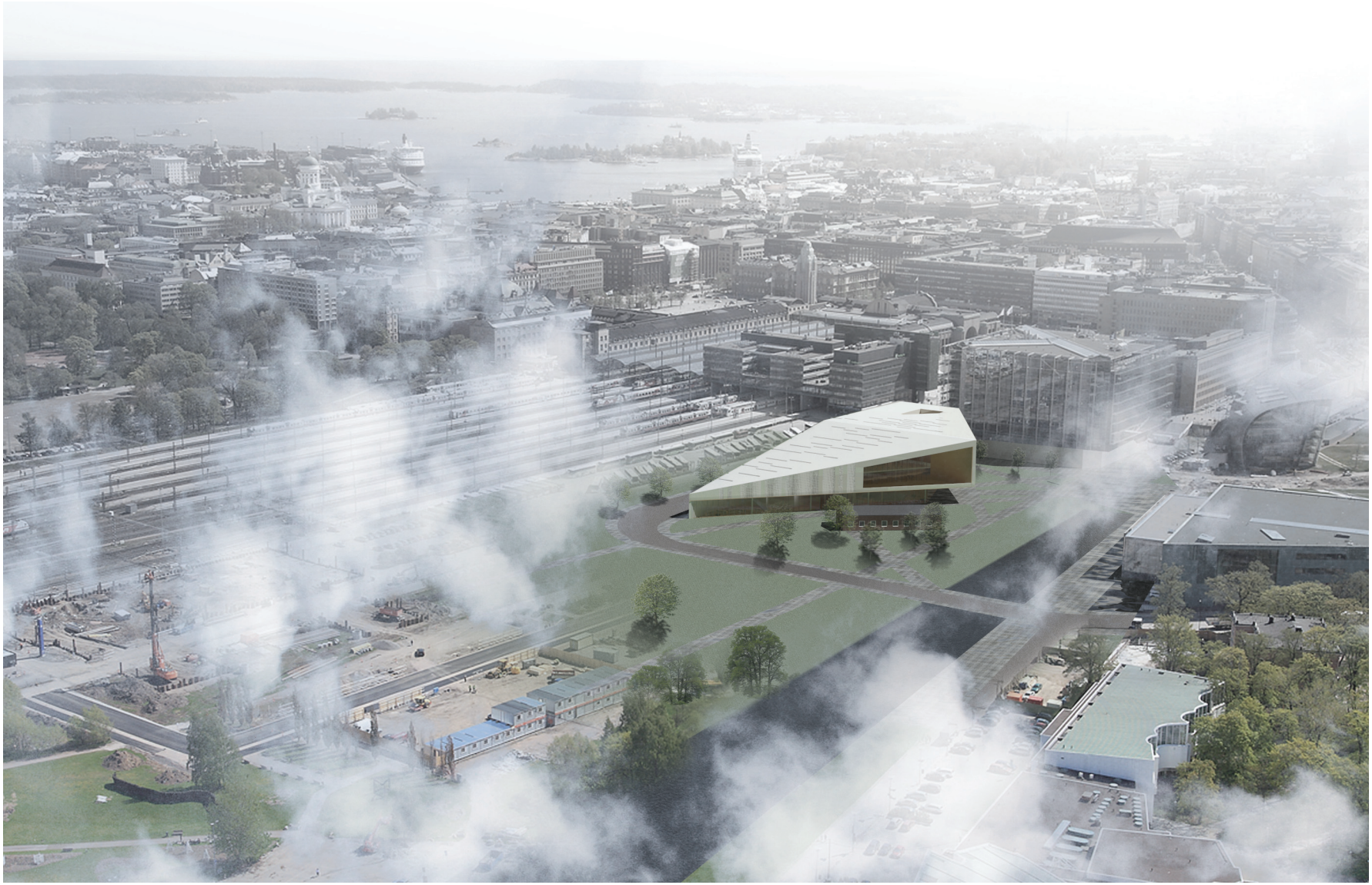
-1. floor plan/ 1:700



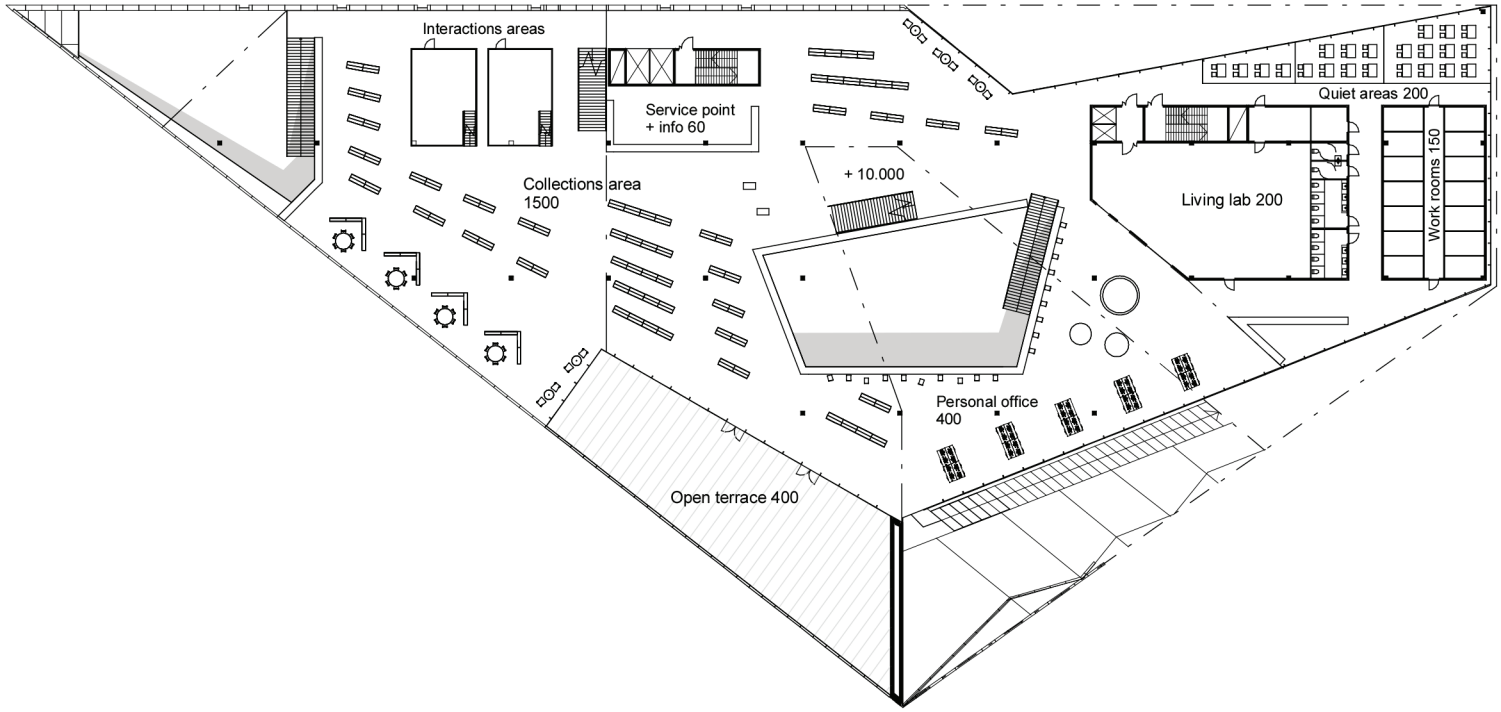
Area plan/ 1:2250



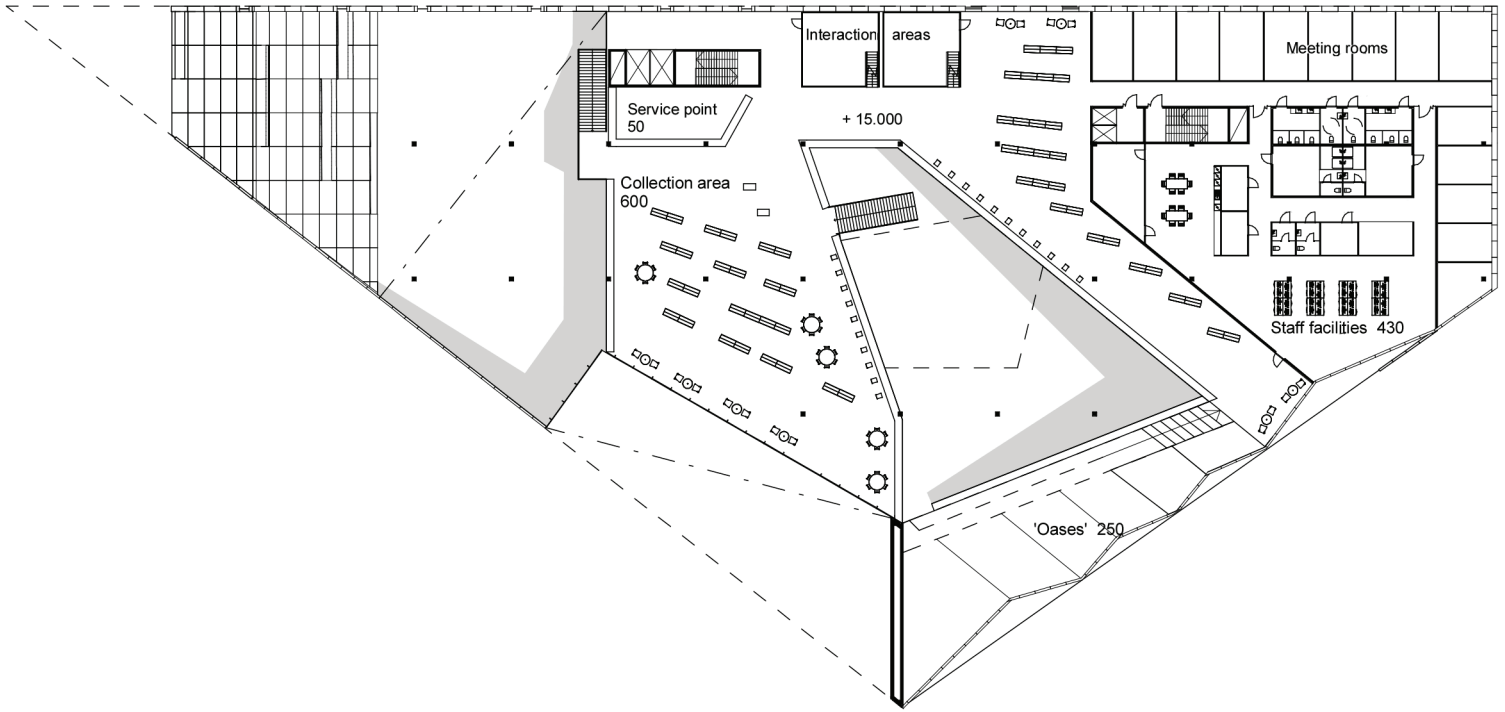
1. floor plan/ 1:700



'Metaphor' of the design could be summarized into words of "spaceship", "vehicle" or "alien object". In terms of these remarks the design is not very succesful as it lacks the humanity and maybe some appeal as well.

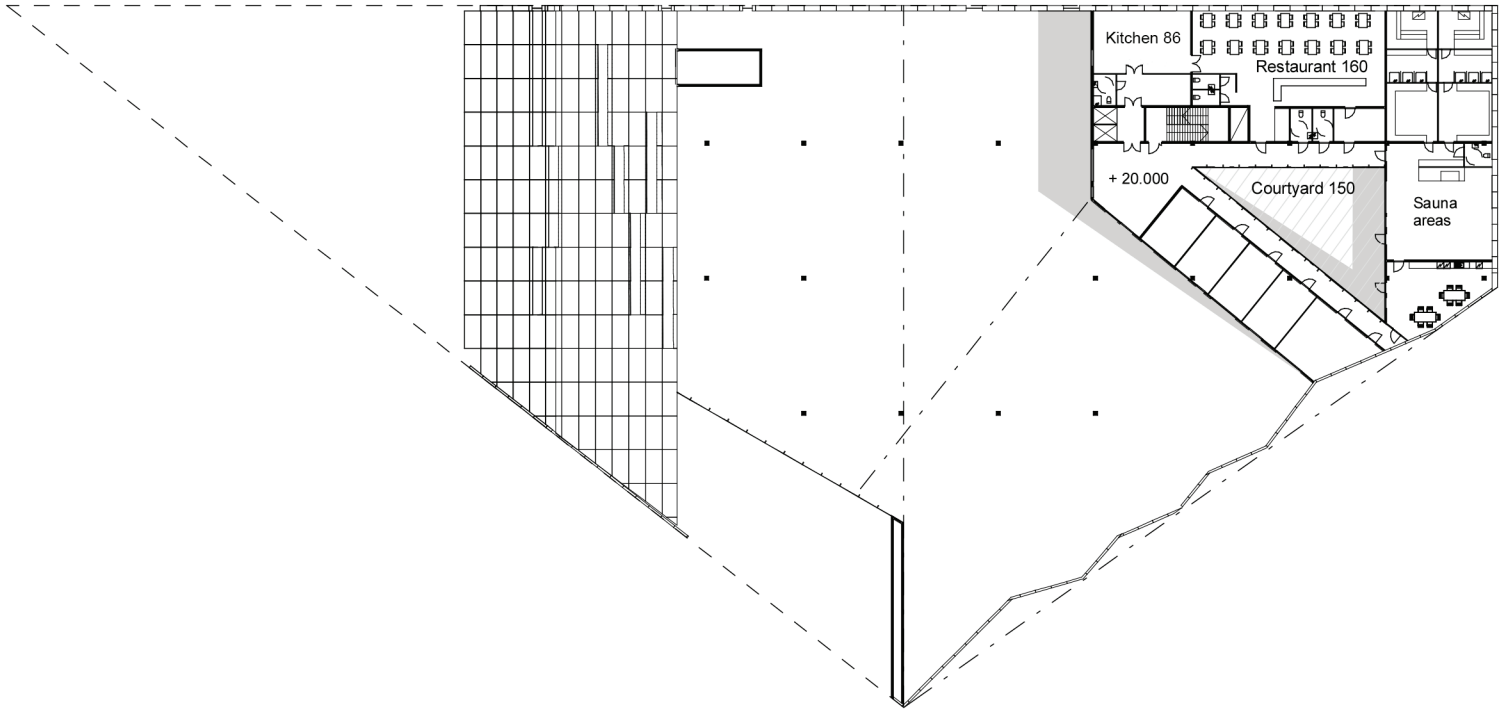


2. floor plan/ 1:700



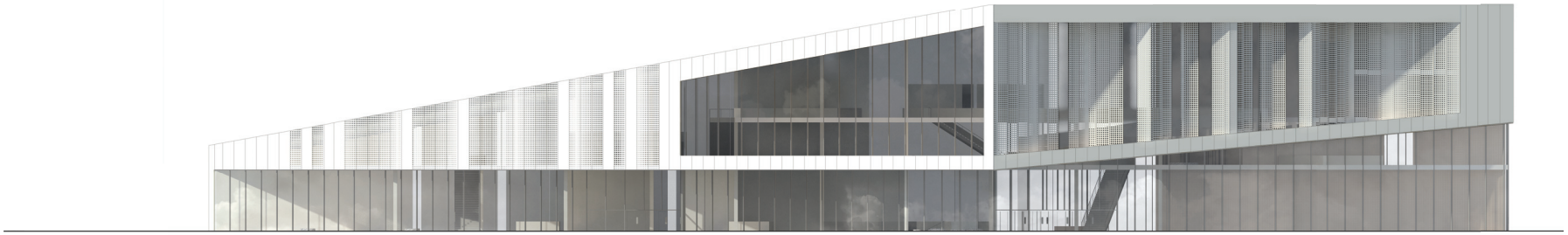
3. floor plan/ 1:700

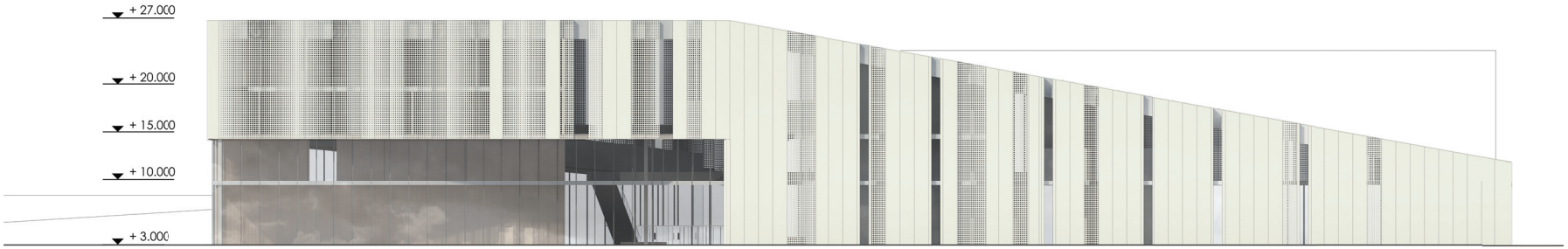

STAGE



4. floor plan/ 1:700

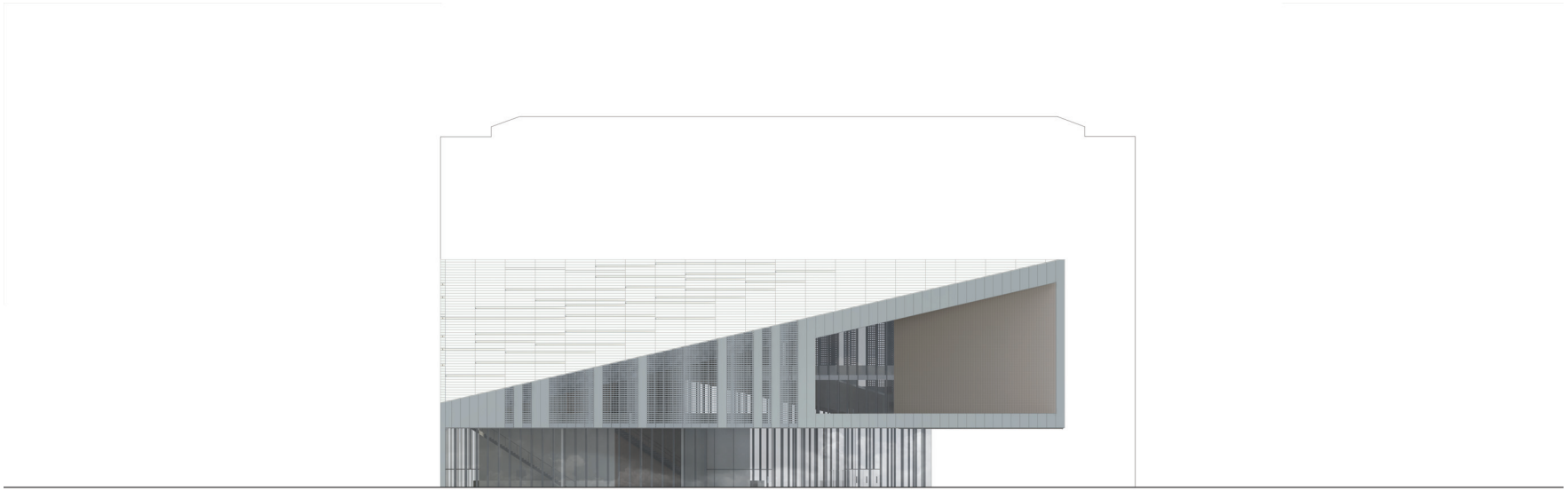

CAFE

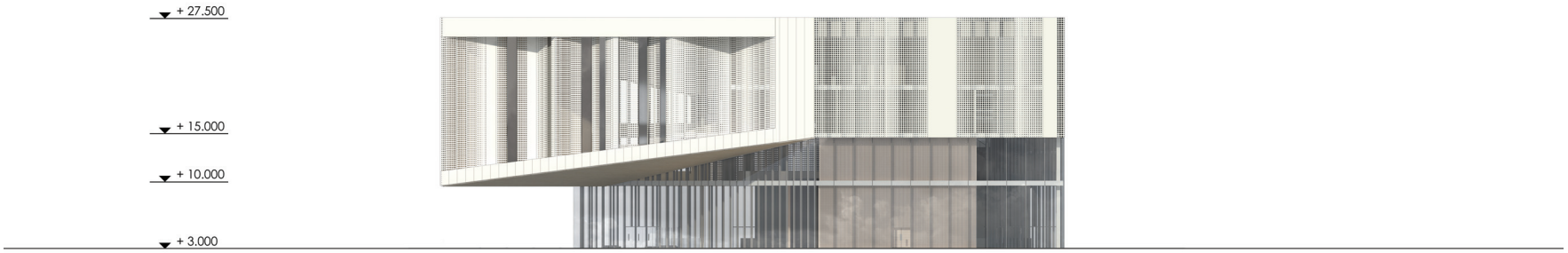




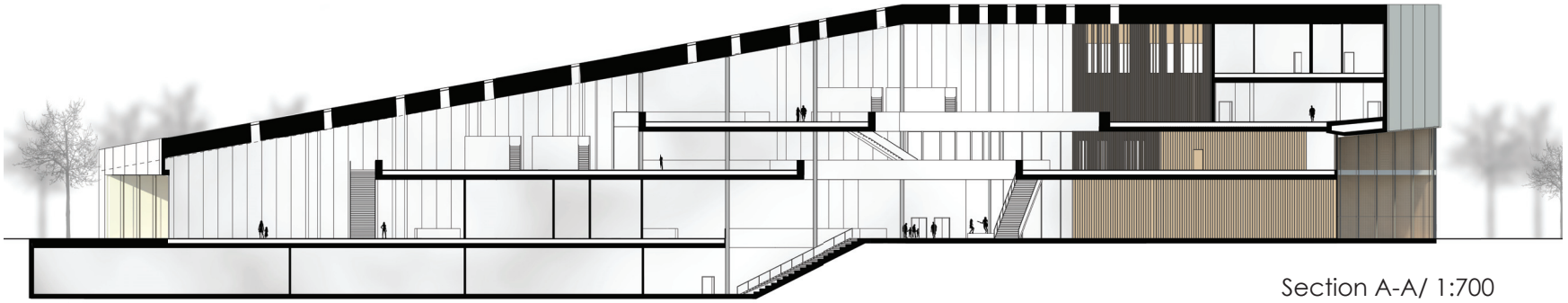
Facades to West and East/ 1:700


HELSINGIN KESKUSTAKIRJASTO

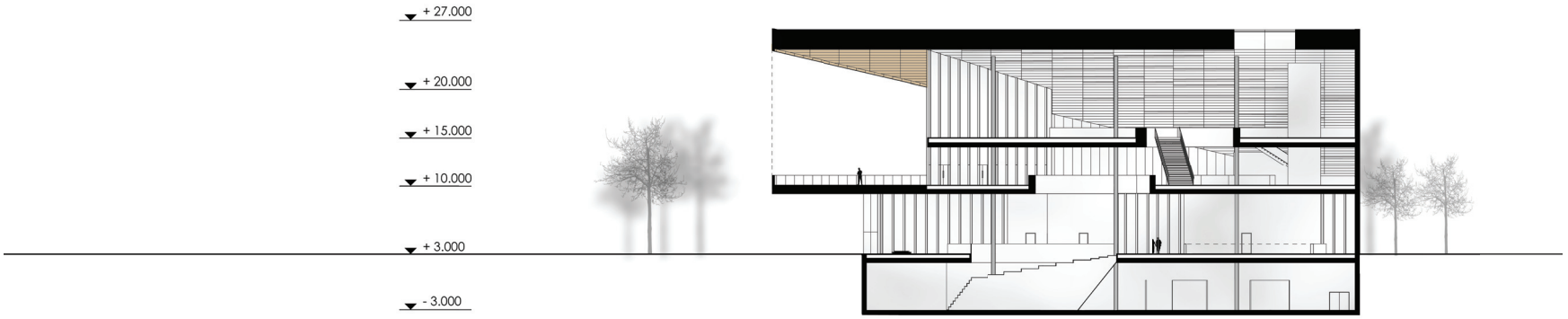




Facades to North and South/ 1:700



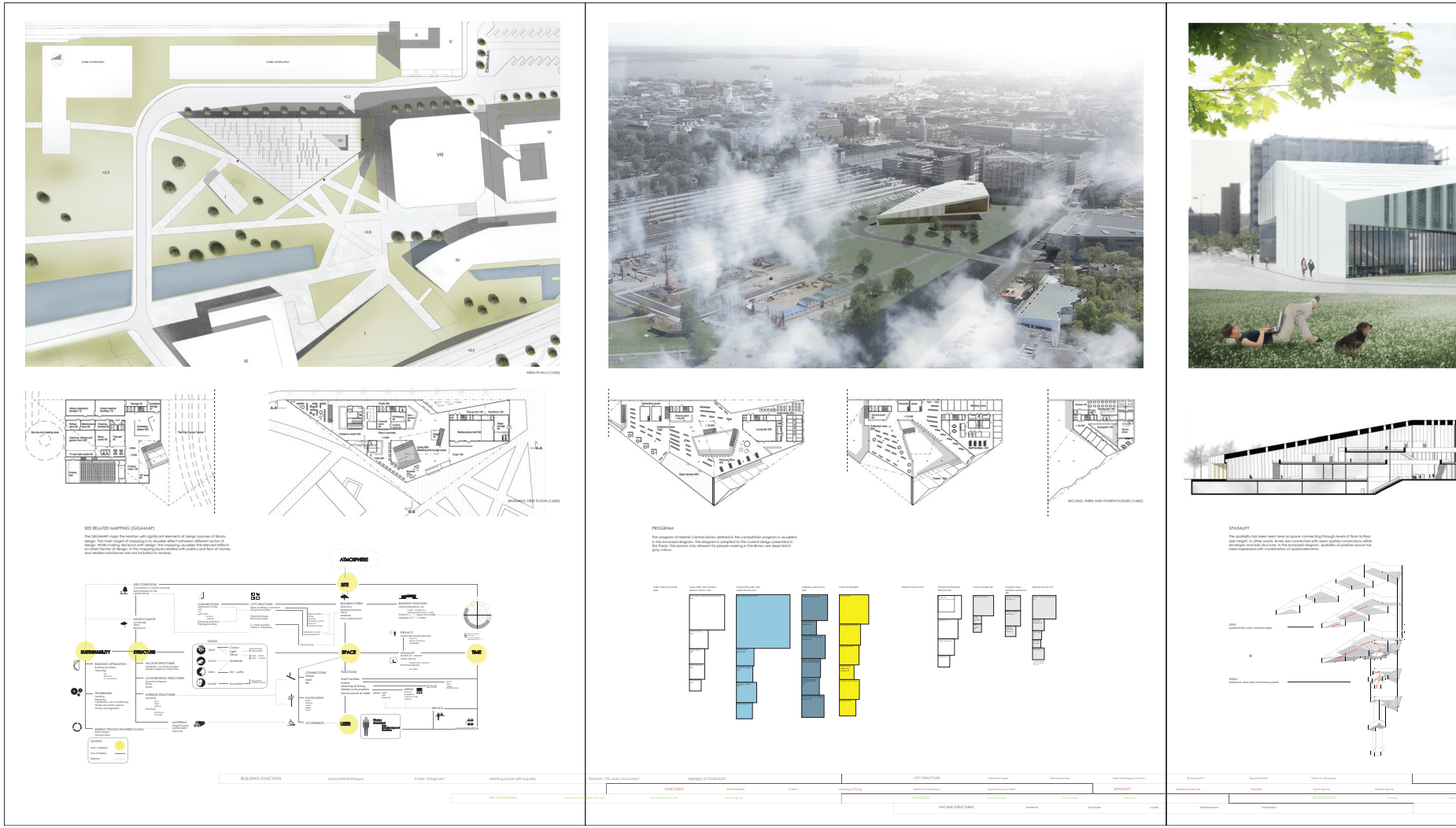
Section A-A/ 1:700

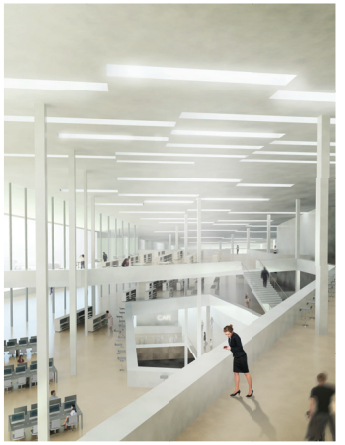


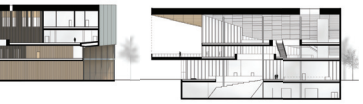
Section B-B/ 1:700

ATTACHMENT B

A1 BOARDS OF THE MASTER'S THESIS PROJECT







SECTIONS A-A and B-B (1:1400)

FACADES TO WEST AND NORTH (1:1400)

LIBRARY IN-BETWEEN

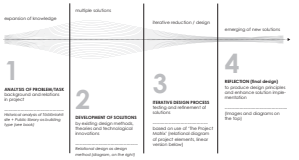
ARCHITECTURE AS PROCESS

Eva Hotanen
MASTER'S THESIS / DIPLOMITYÖ
Tampere University of Technology, The School of Architecture, 2013
Examiner: Professor Ilmari Lahdelma

INTRODUCTION / PROJECT TIMELINE

This Master's thesis project introduces and a new positivist and research based approach to architecture. The goal of the project is to use Helsinki Central Library competition as a design assignment and demonstrate presented design method by building design. The design method is based on the use of mapping relations in design task. The purpose of the method is to support the design process of complex architectural tasks and promote non-linear design process that can produce multiple solutions along the process.

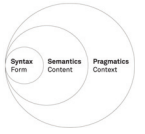
The Project Timeline of is presented in the following diagram. It presents a typical timeline of design of iterative design process. As a result of projects there is data produced that can be stored and refined for the future use. In the design process that is iterative and focused on the documentation of the design process, can lead to several solutions. This approach can be called as "speculative research" or "research as design".



RELATIONAL DESIGN

The background of relational design is in art, when Nicolas Bourriaud coined the term Relational Aesthetics in the eponymous essay of 1998 to describe emerging trends seen in contemporary art at the time. Since then, relational design has been developed in various fields of research and practice as its primary basis. After that it has been used in other fields of design and recently adapted into architecture. Thus, relational design rather forms an extension to general framework of design methods than acts as method itself (see three phases of design below).

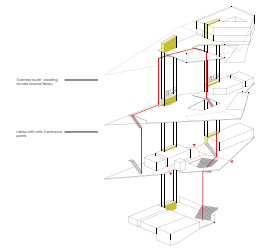
Relational Design can be seen as a new form of design that goes beyond the realms of tradition and conventional practices of architectural design. Relational design in architecture is a method of study in design in the key different feeding points of Relational Design. It is concerned about performance - or use, not as the mechanistic of where interested functionality but rather in the realm of behavior and uncontrollable responses. The context-based approach tries to grasp, embrace the complexity of real-life problems as a part of design process.



METHODOLOGY	SYNTAX	> SEMANTICS	>	(NEW) PRAGMATICS
IDEOLOGY	FORM	> CONTENT	>	CONTEXT
PERIOD	MODERN	> POSTMODERN	>	POST-POSTMODERN

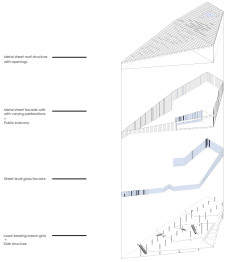
SPATIAL CONNECTIONS

The enclosed diagram presents the main route through the collections area and public spaces of the library. The presented connection is accompanied by two main lift connections. Library can be accessed by public from free points from the ground level. When entered to building, these access point form a different view to the main lobby and the surrounding spaces.



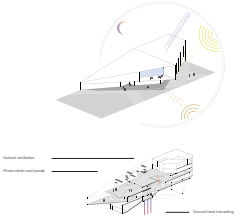
STRUCTURES

The structure of design is depicted as layered diagrams. The layers from bottom to top are: load-bearing structures (columns, slabs and ramps), sheet-level glass facade, partly perforated metal-sheet facade, and roof structure.



SUSTAINABILITY

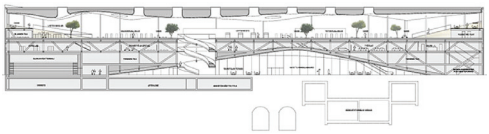
The upper diagram visualizes the outdoor conditions of the designed building around the site. The wall facing midday sun ranging in angles and is covered with perforated steel panels. The balcony around the corner is receiving the evening sun. The interior illustration of the building is presented in the diagram below. The energy production of the building is based on the use of geothermal energy. The ventilation by harvesting ground-heat. Ventilation in the building is handled by natural ventilation.



ATTACHMENT C
HELSINKI CENTRAL LIBRARY FINALISTS

‘KÄÄNNÖS’

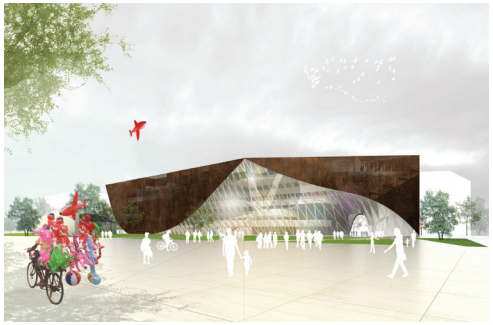
1. place

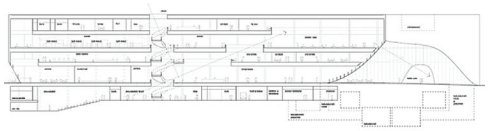


The project is based on twisting front panel that forms lobby space under it. The main collections area is on the top floor with balcony. The middle floor contains media labs etc. Each of three main floors, provides unique spatial and atmospheric character.

‘DIAGONAL AGORA’

3. place

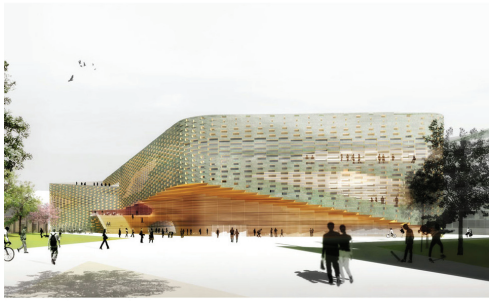


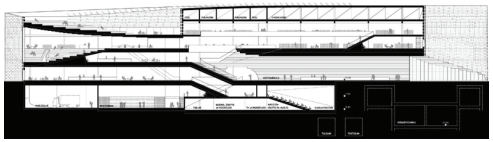


The shape of the building is dominated on the large overhang that works as entrance. The interior spatiality is relatively basic themes of spatiality.

‘KASI’

3. place





Building based on interlocking shape of figure-eight. The open spaces are formed on the side of eight-shaped route. The most apparent feature of design is extensive use of wood.

‘HEARTBEAT’

honourably mention

The spatiality of building is based on two open-spaces: the stepped collection area and entrance hall.

‘DIAGONAL AGORA’

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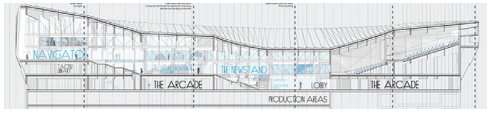

Longitudinal section shows the stepped section connecting through the whole building. Enclosed spaces, as well as, lifts and stairs are located in straight backline.

‘WAVE’

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Undulating facade with relatively small scale is creating the character for the proposal. It is also visible in the inside space as openings and room divisions.

REFERENCES

PRINTED

BERKEL, BEN VAN & BOS, CAROLINE. UnStudio: Design Models. Thames & Hudson, 2006

BRAATHEN, MARTIN, REINHARD, KROPF & STANGELAND, SIV HELEN. Helen & Hard: Relational Design. Hatje Cantz, 2012

CHARRINGTON, HARRY & NAVA, VEZIO. Alvar Aalto: The Mark of the Hand. Rakennustieto, Estonia 2011

CORTES, JUAN ANTONIO. El Qroquis, OMA Rem Koolhaas 134-135. Madrid, 2007

FEIREISS, KRISTIN & LUKAS. Architecture of Change 2: Sustainability and humanity in the built environment. Gestalten, Berlin, 2009

FOCAULT, MICHEL: Tarkkailla ja rangaista. Otavan kirjapaino, Keuruu 2005 (original print: Surveiller et punir. Naissance de la prison, 1975)

HENSEL, MICHAEL, MENGES, ACHIM & WEINSTOCK, MICHAEL. Emergent Technologies and Design, 2009

JENCKS, CHARLES & BAIRD, GEORGE. Meaning in Architecture. Barrie & Rockliff: The Cresset Press, 1969

KLANTEN, ROBERT, et al. Data Flow 2: Visualizing information in graphic design. Gestalten, Berlin, 2010.

MUROLE, PENTTI. Ihmistä Ei Voi Suunnitella - Kiveä Voi. Arkkitehtuuritoimisto B & M, Helsinki, 2012

PALLASMAA, JUHANI. Space, Place and Atmosphere - Peripheral Perception in Architectural Experience. Finish Architectural Review, 5/2011

PALLASMAA, JUHANI. The Embodied Image: Imagination and Imaginery in Architecture. John Wiley & Sons Ltd, 2011

PRIZEMAN, ORIEL. Typology Quarterly libraries. Architectural Review, 11/2011

RENDELL, JANE. Critical Architecture. 2007

RIDELL, SEIJA., KYMÄLÄINEN, PÄIVI. & NYYSSÖNEN,TIMO. Julkisen tilan poetiikkaa ja politiikkaa. Tampere University Press, 2009

SANDAKER, BJORN, EGGEN, ARNE AND CRUVELLIER, MARK. The Structural Basis of Architecture, Second edition. Routledge, 2011

SHANE, GRAHAME DAVID. Recombinant urbanism: Conceptual Modeling in Architecture, Urban Design, and City Theory. John Wiley & Sons, 2005

SPUYBROEK, LARS. Machining Architecture, Thames & Hudson, London, 2004

TSCHUMI, BERNARD. Architecture and Disjunction. MIT Press, 1996

URSPRUNG, PHILIP. Herzog & De Meuron: Natural History. Lars Muller Publishers, 2002

ZUMTHOR, PETER. Thinking Architecture. Birkhäuser, 1988

KOOLHAAS, REM AND MAU, BRUCE. S,M,L,XL The Monacelli Press, 1992

ELECTRONIC

BLAUVERT, ANDREW. Towards Relational Design. Design Observer, 2008

CASTELLS, MANUEL. Grassrooting The Space of Flows. Bellwether Publishing, 1999.

CENTRAL LIBRARY REVIEW REPORT, The Heart of Metropolis - The Heart of Helsinki, 2007.

COMPETITION PROGRAM 2012-2013, Helsinki Central Library Architectural Competition, 2012.

DCC 08 (Design + Computing Cognition 08), Form-Making versus Form-Finding: Distributed Cognition and the Affordances of Design Media. http://www.cc.gatech.edu/~ellendo/dcc-form.htm

FINLANDIA PARK, www-page. Referred 20.08.2013. http://www.finlandiapuisto.fi/pages/en/park-under-construction.php.

HOLLOWAY, TIM. Defining Relational Design, a Conceptual Analysis. 2012.

MACH, ERNST. The Analysis of Sensations and The Relation of the Physical to the Psychical. (1886, revisited 1905). Referred 03.04.2013. http://www.marxists.org/reference/subject/philosophy/works/ge/mach.htm

MYHUMANITIESSTUDIO, www-page. Referred 12.5.2013. http://www.mhhe.com/HumanitiesStudio/2/2/1.html

SEVALDSON, BIRGER. Giga-Mapping: Visualization for Complexity and Systems Thinking in Design. Oslo School of Architecture and Design, OCEAN 2011

SOMOL, ROBERT & WHITTING, SARAH. Notes around the Doppler Effect and Other Moods of Modernism. Perspecta, Vol. 33, Mining Autonomy, The MIT Press, 2002

UNSTUDIO, www-page. Referred 16.04.2013. http://www.unstudio.com/research/asp/active-and-passive-circle